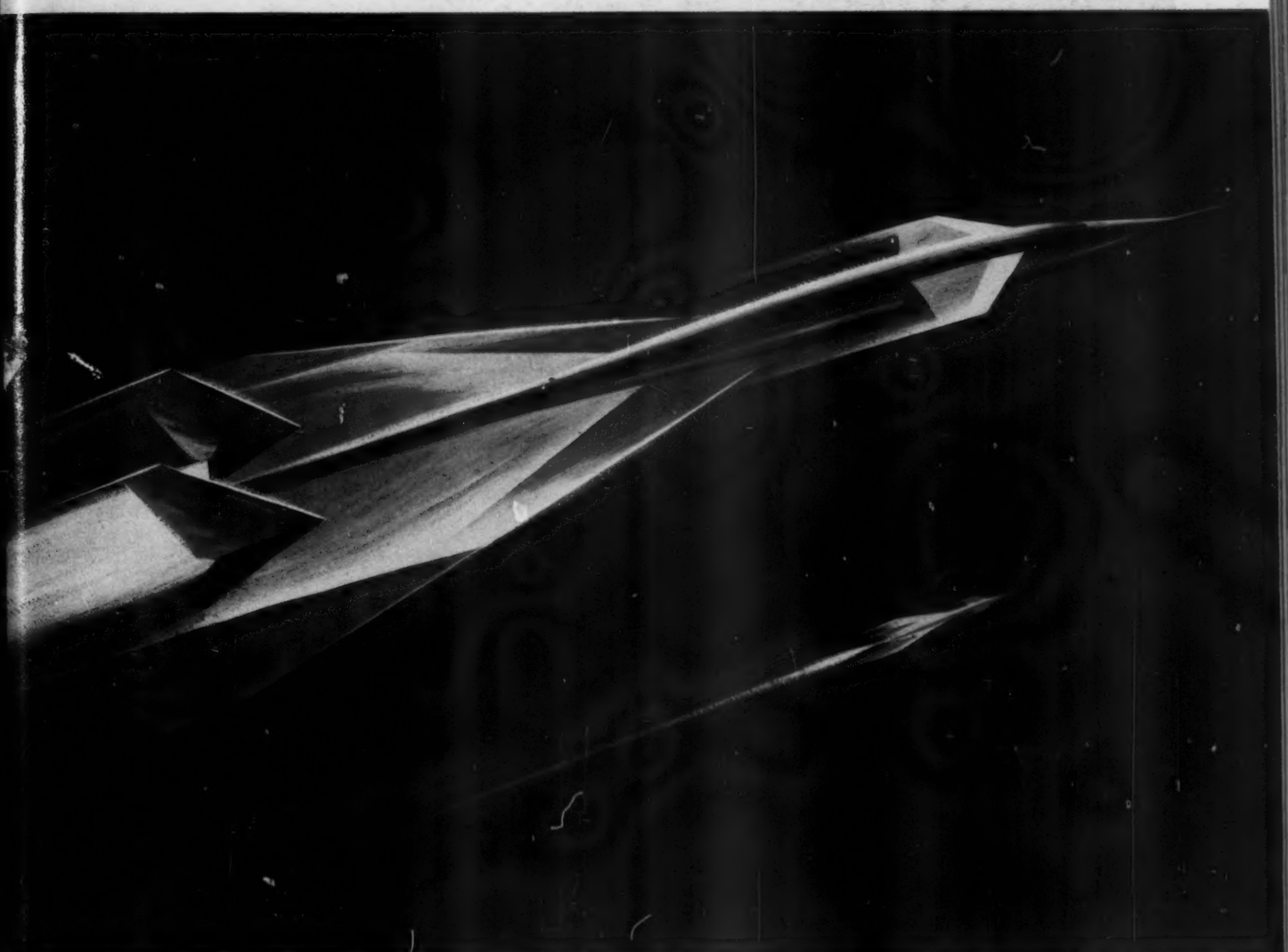
JANUARY 1960 / 50c

AIR FORCE

and SPACE DIGEST

THE LIBRARY OF THE
JUL 28 1961
UNIVERSITY OF ILLINOIS

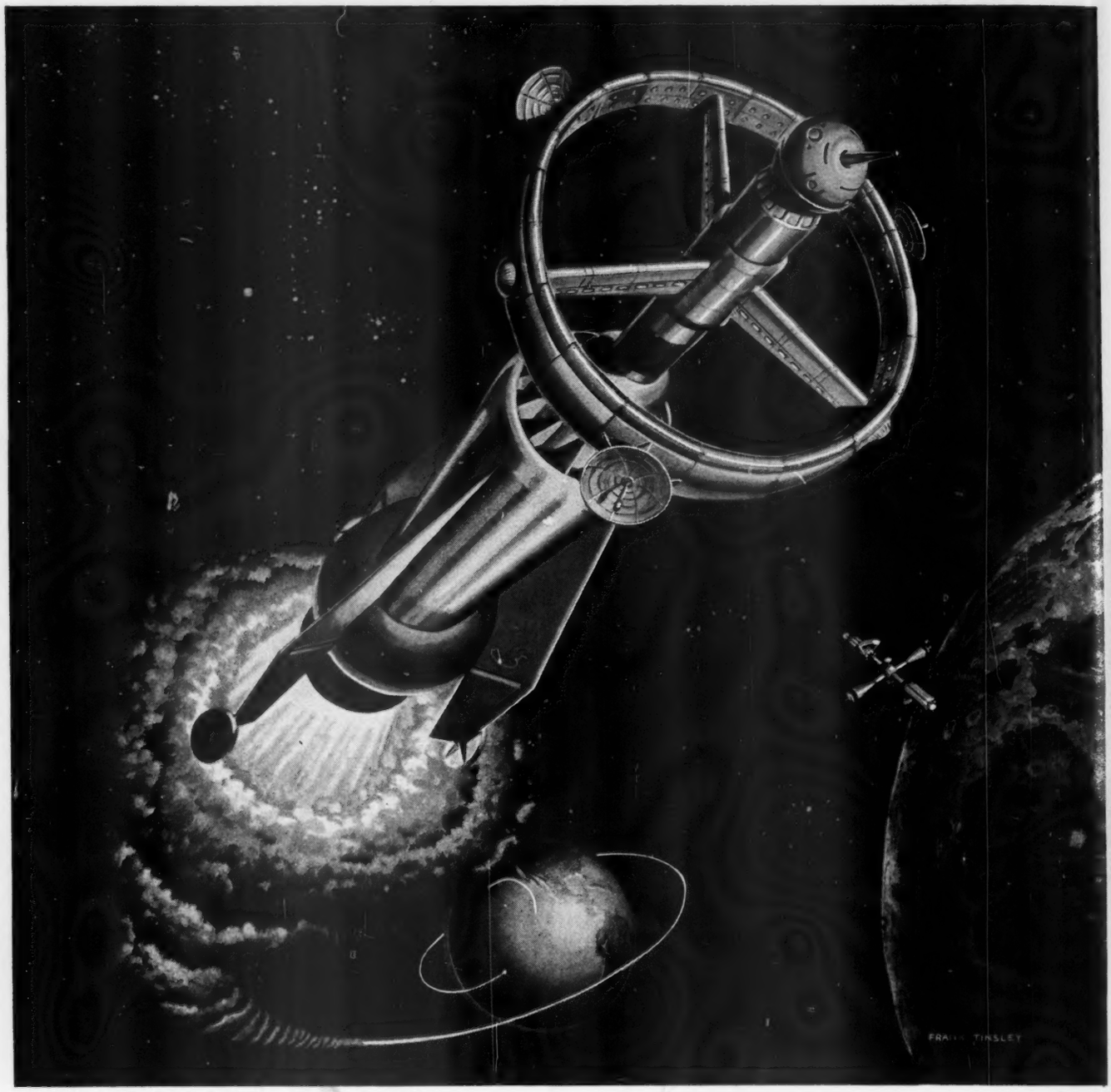
The Magazine of Aerospace Power / *Published by the Air Force Association*



B-70 *Say, it's only a paper plane sailing over a cardboard sky*

SEE PAGE 29

©



STEPS IN THE RACE TO OUTER SPACE

Atomic Pulse Rocket

This is the Atomic Pulse Rocket, a pot-bellied space ship nearly the size of the Empire State Building, propelled by a series of atomic blasts.

The enormous rocket (weighing 75,000 tons fully loaded) is designed to leave Earth with a thrust of 100,000 tons. Altogether a thousand atomic blasts—each equal to 1,000 tons of TNT—are fired from a low velocity gun into a heavy steel rocket engine at a rate of one per second until the vehicle leaves Earth's atmosphere. Then steam and vaporized steel maintain the thrust. After transit speed is reached, and the propulsion system shut off, power is provided by solar batteries plating the wing and body surfaces.

Inside the rocket, living quarters are situated in the rim of a pressurized wheel-like cabin which revolves to provide artificial gravity. Radio and radar antennae revolve with it. Tubular hydroponic "gardens" on either side of the rim grow algae to produce oxygen and high protein food.

The Atomic Pulse Rocket could transport payload to the Moon at $6.74 per lb., less than one quarter the prevailing air freight charges over equivalent distance.

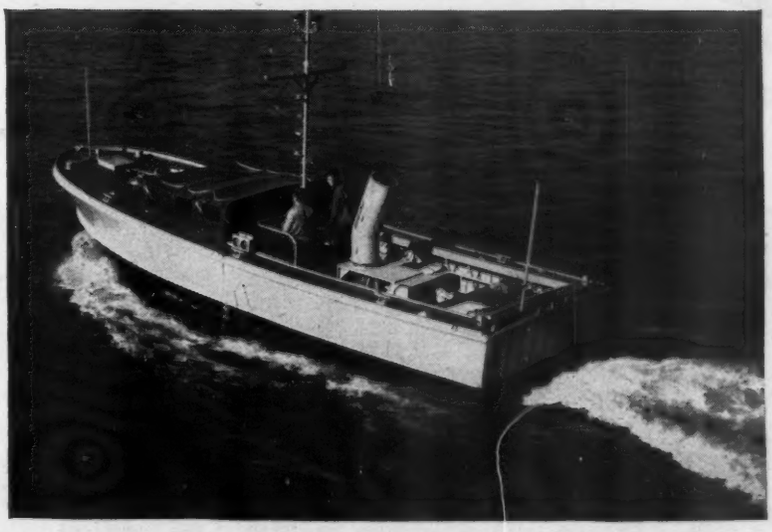
A similar project is past the pilot-study stage in the Defense Department.

ARMA, now providing the inertial guidance system for the ATLAS ICBM and engaged in advanced research and development, is in the vanguard of the race to outer space. For this effort, ***ARMA*** needs scientists and engineers experienced in astronautics. ***ARMA***, Garden City, New York. A Division of American Bosch Arma Corporation.

AMERICAN BOSCH ARMA CORPORATION

BULLETIN FROM **BOEING**

SPACE RESEARCH. Drawing of lunar base support project, typical of advanced areas of research by Boeing scientists. Boeing studies include lunar trajectories, space vehicle design, propulsion and guidance, meteoroidal impact research. Another advanced project at Boeing is the development, under Air Force contract, of the Dyna-Soar boost-glide vehicle. Boeing also holds contract as weapon system integrator for the Air Force's planned advanced solid-propellant intercontinental ballistic missile system, Minuteman.



MISSILE BOMBER. Boeing B-52G is the U.S. Air Force's most versatile long-range weapon system. In addition to its regular nuclear bomb load, the B-52G carries supersonic Hound Dog missiles for in-flight launching toward targets several hundred miles away. On a single retaliatory defense mission, the B-52G could strike several targets thousands of miles apart.

MINESWEEPING LAUNCH, powered by Boeing 502 gas turbine, is first turbine-powered craft to go into fleet service with U.S. Navy. Boeing turbines serve in seven different Navy applications, including landing craft and personnel boats, electrical and smoke-screen generators. Boeing turbines also power helicopters and small aircraft.

BOEING

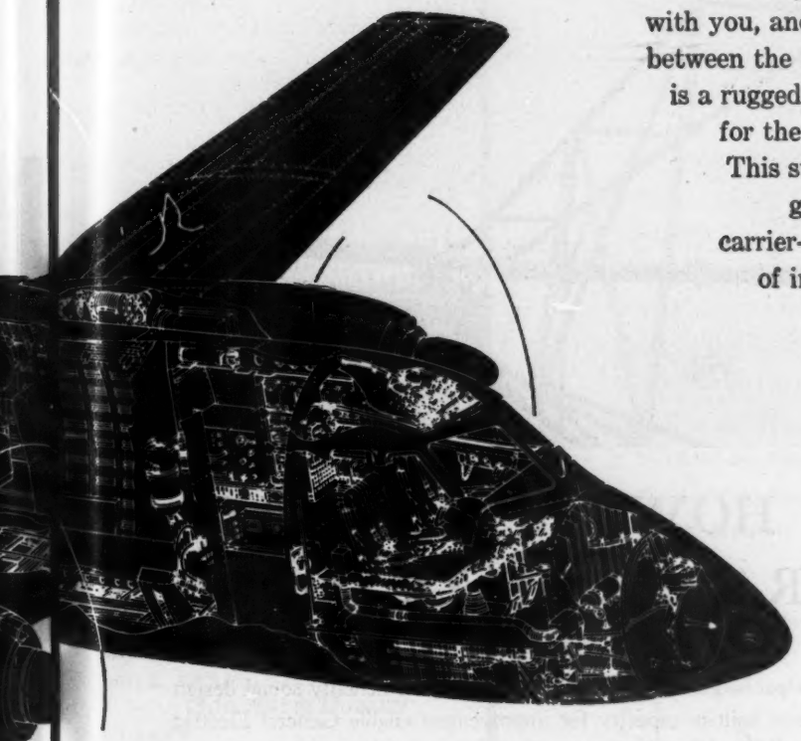
YOU ARE INVITED to inspect the Gulfstream and arrange for demonstration flights through one of the following distributors: Atlantic Aviation, Wilmington, Delaware; Southwest Airmotive, Dallas, Texas; Pacific Airmotive, Burbank, California; Timmins Aviation, Montreal.

Instrumentation, including the most up-to-date and sophisticated communication, navigation and radio equipment, is custom built into the Gulfstream by these distributors. Custom cabin interiors are fitted to customer specifications. Illustration shows how one Gulfstream owner decorated the aircraft's interior.

Beauty...is more than skin deep

The beauty of any business airplane must be weighed against its past. If it is a "re-do" of an older airplane, the structural stress and strain of years of operation may be invisible today, critical tomorrow. The business airplane must be qualified to meet the stringent licensing requirements demanded by today's—and tomorrow's—all-weather and high density traffic conditions.

A business airplane, like the Grumman Gulfstream, *starts new* with you, and has beauty more than skin deep. Sandwiched between the Gulfstream's clean exterior and custom interior is a rugged Grumman structure built to withstand fatigue for the equivalent of more than 50 years of operation. This structure is based on the most recent knowledge gained from designing supersonic, and especially carrier-based aircraft, required to withstand the rigors of in-fleet service. Within the Gulfstream's nacelles are two Dart turbo-prop engines, their famous Rolls-Royce reliability proven by millions of airline flight hours.



When you select the Gulfstream you get an airplane, new from nose to tail, conceived and engineered by Grumman for today's business flying operations, in terms of performance, utility, reliability, and all-weather safety.

GRUMMAN

AIRCRAFT ENGINEERING CORPORATION

Bethpage • Long Island • New York

HOW A 6-YEAR-OLD RADAR STAYS YOUNG

A six-year operational veteran, the FPS-6 is still the principal height-finder for air defense. Fundamentally sound design and built-in capacity for improvement enable General Electric to keep this radar "young."

Contrasted with earlier versions, today's FPS-6 features height line display as a full-time trace. Indicator calibration, sector scan, performance monitoring and azimuth blanking are automatic. The nod angle, formerly fixed, has been made variable to attain more hits per target. A new ferrite isolator increases magnetron life and stability. Noise figure has been improved by nearly 1.5 db.

The sustained effectiveness of this radar at operational sites during six years of a rapidly changing air defense environment is truly an achievement in defense electronics. 227-4

Progress Is Our Most Important Product

GENERAL ELECTRIC

DEFENSE ELECTRONICS DIVISION
HEAVY MILITARY ELECTRONICS DEPARTMENT

623.7405
AA
v.43

AIR FORCE

THE MAGAZINE OF AEROSPACE POWER

Volume 43, Number 1 • January 1960

JAMES H. STRAUBEL *Publisher*

STAFF

JOHN F. LOOSBROCK
Editor and Assistant Publisher

RICHARD M. SKINNER
Managing Editor

CLAUDE WITZE
Senior Editor

WILLIAM LEAVITT
Associate Editor

FREDERIC M. PHILIPS
Associate Editor

JACK MACLEOD
Art Director

NELLIE M. LAW
Editorial Assistant

PEGGY M. CROWL
Editorial Assistant

BARBARA SLAWECKI
Editorial Assistant

MICHAEL BURDETT MILLER
Research Librarian

GUS DUDA
AFA Affairs

ARLINE RUDESKI
Promotion Assistant

ADVERTISING STAFF

SANFORD A. WOLF
Advertising Director

JANET LAHEY
Advertising Production Manager

AIR FORCE Magazine and **SPACE DIGEST** are published monthly by the Air Force Association. Printed in U.S.A. Reentered as second-class matter, December 11, 1947, at the post office at Dayton, Ohio, under the act of March 3, 1879. **EDITORIAL CORRESPONDENCE AND SUBSCRIPTION** should be addressed to Air Force Association, Mills Building, Washington 6, D. C. Telephone, STerling 3-2300. Publisher assumes no responsibility for unsolicited material. **CHANGE OF ADDRESS:** Send us old address *and* new address (with zone number, if any) to Air Force Association, Mills Building, Washington 6, D. C. Allow six weeks for change of address. Send notice of **UNDELIVERED COPIES** on Form 3579 to AIR FORCE Magazine, Mills Building, Washington 6, D. C. **SUBSCRIPTION RATES:** $5.00 per year, $6 per year foreign. Single copy 50 cents. Association membership includes one-year subscription: $6.00 per year (Cadet, Service, and Associate membership also available). **ADVERTISING CORRESPONDENCE** should be addressed to Sanford A. Wolf, Advertising Director, AIR FORCE Magazine and SPACE DIGEST, 501 Madison Ave., New York 22, N. Y. (PLaza 2-0235). New England office: Morley L. Piper, Resident Manager, 428 Essex St., Hamilton, Mass. (HAmilton 1523). Midwest office: Urben Farley & Company, 120 S. LaSalle St., Chicago 3, Ill. (FInancial 6-3074). West Coast office: Harold L. Keeler, Sales Manager, and Hugh K. Myers, 625 S. New Hampshire Ave., Los Angeles 5, Calif. (DUnkirk 5-1436). **TRADEMARK** registered by the Air Force Association.

Copyright, 1960, by the Air Force Association. All rights reserved under Pan American Copyright Convention.

FEATURES

Editorial
JOHN F. LOOSBROCK 6

The Gutting of the Valkyrie
ED MACK MILLER 29

Awareness Is a Weapon
JAMES B. CONANT 34

The Town That's Learned to Live with the Sonic Boom
CLAUDE WITZE 38

Air Force Medicine Moves into the Space Age
MAJ. GEN. OLIVER K. NIESS, USAF 40

A Look at Bounder
A RED AIRPOWER FEATURE 46

Survival in the Nuclear Age
EUGENE M. EMME 48

The Soviet Challenge
W. W. ROSTOW 52

SPACE DIGEST
Starts on page 57

The Discouraging History of Disarmament
JERRY GREENE 93

Atlas: The Story of a Missile—A Book Review
REVIEWED BY COL. OTTO J. GLASSER, USAF 106

Keeping the Record Straight
MARY FINCH TANHAM 120

DEPARTMENTS

Airmail 8
Airpower in the News 12
What's New With Red Airpower 19
Aerospace World 20
The Ready Room 98
AFA News 100
Index to Advertisers 105
Airman's Bookshelf 108
This Is AFA 124

An Editorial

Variation on a Theme

John F. Loosbrock, Editor

"It is not the case that Germany is rapidly approaching equality with us. . . . Germany is actively engaged in the production of service aircraft, but her real strength is not fifty percent of our strength in Europe today."—*Stanley Baldwin, about to become Prime Minister of Great Britain, in a speech in the House of Commons, November 28, 1934.*

"Recent advances in other countries have equaled if not exceeded our efforts. We have known for some time that foreign nations far surpassed us in the number of military aircraft at their disposal, but we also knew we led the field technically. It now appears that our research and development programs must be accelerated if we are to regain our position of technical leadership."—*Statement by Assistant Secretary of War Louis Johnson, contained in the Annual Report of the Secretary of War, June 30, 1938.*

"[An attack] would find us better prepared than we have been at any time since we laid down our arms in 1945."—*From a speech by Secretary of Defense Louis Johnson on December 7, 1949.*

" 'After all, we're no longer waiting for war to break out in Berlin any day,' comments a top Defense Department policy-maker. 'It'll be easier to convince the public and Congress that canceling marginal weapons programs will be a wise move.' "—*From a dispatch by Louis Kraar in* The Wall Street Journal, *August 20, 1959.*

"The Administration will retire up to 900 aircraft under Administration pressure to save money for missiles and other atomic-space-age equipment. . . . The Air Force is bearing the brunt of economy and streamlining actions imposed by the Administration's determination to hold the line on defense spending and keep it running at about the $41 billion-a-year level."—*An Associated Press dispatch in the New York* Times, *December 6, 1959.*

"President Eisenhower's picturesque six-hour visit to Afghanistan today was a curious episode in the cold war.

"An escort of Russian-made MIG fighters, owned by Afghanistan and piloted by Afghan flyers, picked up the President's plane near the Pakistan border and escorted it to the vicinity of Bargram Airport, where he landed.

"The runway on which he landed was built by the Russians. When he was receiving welcome honors, the MIGs roared over his head in salute."—*A dispatch by Robert J. Donovan in the New York* Herald Tribune, *December 10, 1959.*

"People have more money to spend, and they're spending it for Christmas. That is the report from almost every section of the country as merchants ring up sales which they expect will be the biggest for any Yule season in history."—*An Associated Press dispatch in the Washington* Evening Star, *December 12, 1959.*

• • •

Britain decided in the thirties that it couldn't afford to compete with Hitler. The result was that it came uncomfortably close to perishing as a nation and did decline to a second-rate power.

The United States decided in the late forties that it couldn't afford to compete with the Communists. The result was that the Reds felt emboldened to test our will with their military venture in Korea—an unsatisfactory, bloody, and expensive stalemate from our viewpoint.

At this writing, in the midst of the biggest Christmas shopping spree in our history, America apparently has decided it can't afford to try to win the space race, the missile race, the educational race, or indeed, any race that puts this country in direct competition with the rapid Soviet buildup. Presumably, the United States will continue to protect its world leadership in such vital items as lipsticks, mink stoles, electric trains, pop-up toasters, and stored wheat.

The latest bewildering action in this Looking Glass World, which finds America cutting its capability while the opposition continues to gain strength, is the decision to "reorient" the B-70 bomber program.

The need for the B-70, which is well documented beginning on page 29, had little bearing on the decision. The Air Force was firmly convinced of its worth or the program wouldn't be this far along. A catalogue of B-70 virtues only points up the witlessness of its cancellation as a weapon system.

The fact that United States-based B-70s could be over Laos or Formosa in about three hours' flying time is apparently beside the point. The advantages the B-70 would give this nation, during a period when the Soviet Union will outnumber us in intercontinental missiles—advantages such as recall, diversion, multiple target selection, quick reaction time, and the like—are not pertinent to the argument at this juncture.

For the need for the B-70, as a weapon system, is not in question. No one in authority has said the requirement was invalid. The cancellation is not a military decision. It is a budgetary one.

And yet the budgetary argument in favor of the B-70 is perhaps the strongest one of all. Not what it would do to our budget but what it would do to Khrushchev's. The canceling of the B-70 hands an economic and military bonanza to the Russians on a silver platter. It eases the strain on the Soviet economy at the precise time when pressure should be applied rather than removed.

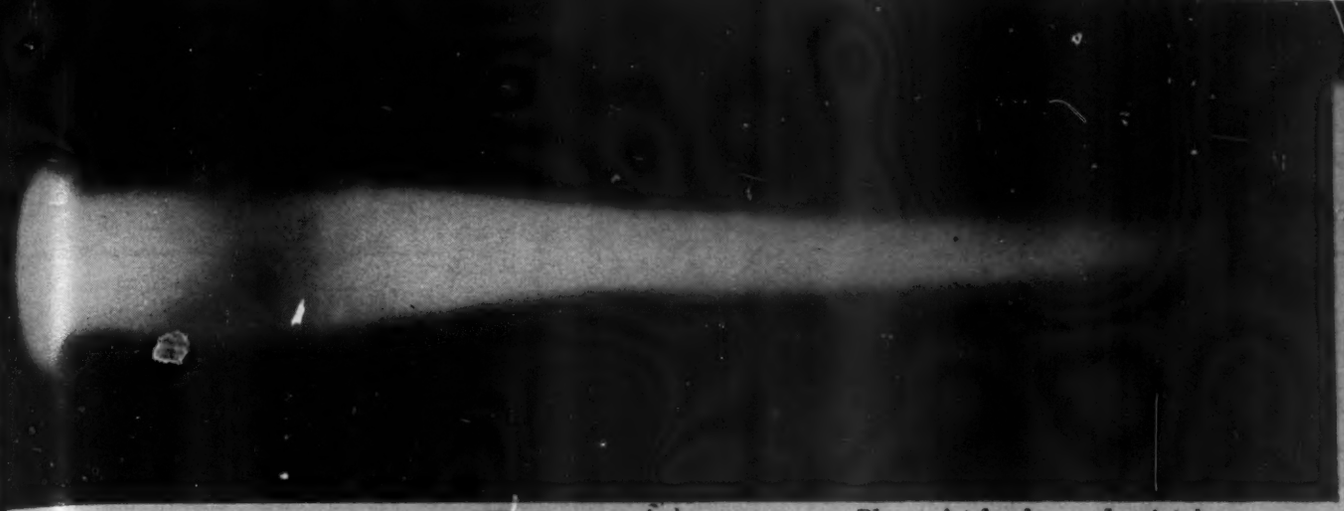
It means that a vast, and expensive, area of air defense can be deleted from the Russian military requirement and hence from their budget. It means that several thousand Red fighters, which the B-70 would make obsolete, remain a useful part of their inventory.

If we didn't need the B-70, or if we truly couldn't afford it, its cancellation could be adjudged a sad, but realistic, fact of life.

But since we do *need* it and *can afford* it, the decision to "reorient" becomes a tragic blunder.

At the moment the decision is not irrevocable. Congress can make the necessary funds available. And an aroused public opinion can exert pressure on the Administration to see that the funds are properly spent.

It's not too late. But it soon will be.—END



Plasma jet develops and maintains temperatures to 30,000° F.

Western Gear developed this solar furnace with high temperature capabilities to 6,000° F.

everybody's talking

about high temperature studies

ESTERN GEAR IS MAKING THEM

s, Western Gear's Research and Development department is making inten-e studies in the metallurgical and thermoelectrical fields to temperatures 30,000 degrees Fahrenheit.

ch studies enable our research engineers to make important contributions major industrial and military programs contracted through our Systems nagement Division.

t us show you how we can put our advanced knowledge and facilities to rk for you. High level confidential consultations without obligation.

ite on your letterhead to Systems Management Division, P. O. Box 182, nwood, California.

PRECISION PRODUCTS DIVISION
INDUSTRIAL PRODUCTS DIVISION
ELECTRO PRODUCTS DIVISION
GRAPHIC ARTS DIVISION
SYSTEMS MANAGEMENT DIVISION
SOUTHWESTERN DIVISION

WG

WESTERN GEAR CORPORATION
SYSTEMS MANAGEMENT DIVISION

AIRMAIL

Price Tag of Survival

Gentlemen: The magnificently written, honest, and hard-hitting editorial, "Pay Now . . . Survive Later" [December '59], is truly a masterpiece that *all* Americans should have the opportunity to read. Unfortunately, only a small percentage of us Americans who really know and care have the opportunity to read these facts through our association with the Air Force Association.

I sincerely believe that copies of this editorial should be reprinted and forwarded to all members of Congress and state and civic officials all over the United States. This contribution by Mr. Loosbrock should and could enable people in responsible public positions to exercise their influence to see that we do survive. All things worth having are worth paying for, and monies wisely spent are a small price for the peace and freedom we enjoy. Let's not be the richest country in the cemetery!

R. C. Ward
Curtiss-Wright Corporation
Washington, D. C.

Gentlemen: That was a very fine editorial on "Pay Now . . . Survive Later." I am bound to say, however, that the mating dance of the whooping crane is possibly not "meaningless" to the cranes.

I am glad you picked up Professor Rostow's statement; but there is a portion of it which seems to me even more eloquent than the one you quoted.

Prof. W. Barton Leach
Harvard Law School
Cambridge, Mass.

● *Other readers have raised the same point on the whooping cranes. Our reply is that the mating dance is a meaningless ritual which isn't worth a whoop!*

The portion of Professor Rostow's statement to which Professor Leach refers was quoted in an editorial in the Boston Herald, *and we reproduce it herewith:*

"I would recall that four of our worst mistakes in modern history arose from fear that our democracy could not deal with the problems it faced, without losing its essence. I refer to the belief of the Republican Administration after 1929 that it could not deal with the great depression without risking unacceptable damage to capitalism; to the belief of isolationists in both parties that we could not deal with Hitler and the Axis without permanently damaging basic qualities in our society; to the belief of the Democratic Administration before June 1950 that our society could not afford a military budget of more than $15 billion; and, I would add, the similar belief of the present Administration that its overriding mission has been to reduce the public budget it inherited, despite the accelerated challenge it has faced since 1953 in many dimensions."—THE EDITORS

Togetherness in the Space Race

Gentlemen: Your editorial "The Far-Sighted Misters of Mugu" in the November issue touches me to the quick. The recommended course of action in the last paragraph is undoubtedly the most needed requirement today if we are to build our national defense and space-age posture into one of practical reality. Now, if only your words would bring action!

It is a mighty pathetic situation when our top military minds can't recess their parlaying and maneuvering for position long enough to give this grand country of ours a much-needed organization with a true and single purpose. And I do mean more unification, if we can't have *complete* unification.

Our services have proven before that they can work together, and in the missile field. I have seen it with my own eyes, having been stationed at Canaveral when the Army, Navy, and Air Force operated the then Joint Long-Range Proving Ground. It was a most satisfying experience.

And now it takes nonaggression pacts to maintain peace among the guardians of our security!

Incidentally, Pt. Mugu is ninety-two miles from Arguello, as the bird flies, not forty. But in the missile age, what difference is there in fifty-two miles?

Bradford A. Evans
Los Angeles, Calif.

● *The Editor assumes personal responsibility for the topographical error but insists that the correct figure only reinforces his argument. After all, who wants to eat a flying crow?*

—THE EDITORS

Team and Individual Responsibility

Gentlemen: I enjoyed Governor Leo A. Hoegh's civil defense article "Your Backyard Is the Battleground," in your November issue, very much.

You are doing a great service in assisting us to educate our people on how to live in this new age. The young people are anxious, the older ones hate to see the necessary changes.

The military and nonmilitary defense is the complete team. Neither one can get along without the other.

C. R. Huebner, Director
N. Y. State Civil Defense Commission
New York, N. Y.

Gentlemen: . . . Having been intimately associated with civil defense since my retirement from the Regular Army in 1952, I am delighted with the article which you carried by Leo A. Hoegh, Director of the Office of Civil and Defense Mobilization. I sincerely appreciate, and I am sure all of my fellow directors will, your program to stimulate public understanding and discussion of the civil defense problem which vitally affects us all.

Col. Arthur L. Shreve, USA (Ret.)
Director, Civil Defense Organization
Baltimore, Md.

Gentlemen: I found your November issue to be most interesting and informative.

Mr. Hoegh's statement concerning civil defense is one which should be of vital importance to all Americans.

Christopher Del Sesto, Governor
State of Rhode Island
Providence, R. I.

Gentlemen: . . . I was especially interested in the article on civil defense and its many useful suggestions. . . .

Wesley Powell, Governor
State of New Hampshire
Concord, N. H.

Gentlemen: Even a quick glance at AIR FORCE/SPACE DIGEST gives one an immediate impression of an opportunity to become more aware of what is happening tomorrow. I congratulate you on the attractive layout and the timely articles included—both call for attention which is repaid by timely discussions and illustrations.

(Continued on page 11)

Ingenuity

Defense contract work takes sound engineering and plenty of ingenuity. We've turned the trick for DOD as well as for primes, in metallurgical research, development engineering, production engineering, fabrication and assembly. We can handle major projects in whole or in part, at any stage from original theoretical conception to the completion of operational assemblies. If our unusual abilities and capacity can help you, contact any American Car and Foundry sales office or: Director of Defense Products, American Car and Foundry, Division of ACF Industries, Incorporated, 750 Third Avenue, New York 17, N. Y. *Sales Offices:* New York—Chicago—Cleveland—Washington, D. C.—Philadelphia—San Francisco—St. Louis.

USAF's far-ranging Snark ICBM is ground-transported and launched by this rugged mobile launcher, produced by ACF for Northrop Aircraft, Incorporated, the prime contractor.

AMERICAN CAR AND FOUNDRY

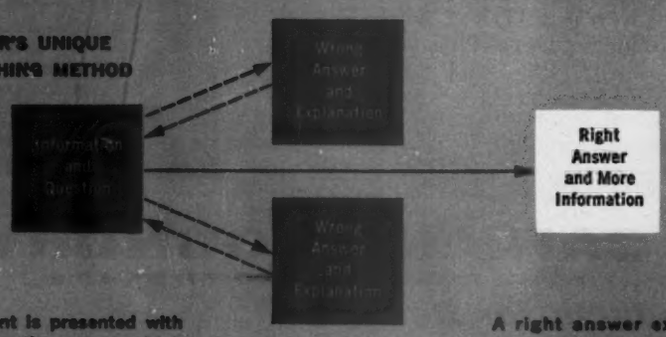
DIVISION OF ACF INDUSTRIES, INCORPORATED

Products for Defense

For example: Rocket Engine Cases • Missile Ground Support and Installation Equipment Artillery Shells • Radar Structural Members • Armor Plate • Armored Vehicles

AMERICAN CAR AND FOUNDRY CAN DO ANYTHING WITH METAL

TUTOR'S UNIQUE TEACHING METHOD



Student is presented with information upon which he is immediately questioned. His answer determines the next step to take in his learning process.

A wrong answer is explained and he is directed to go back to the original question to "try again."

A right answer exposes new subject matter and the question-and-answer process is repeated. Thus, the student is able to learn at his own best pace.

USI

Western Design

Div. of U.S. Industries, Inc.
Santa Barbara Airport
Goleta, California

since Plato's time . . .

the automated

TUTOR

by Western Design

is the most effective new way of implanting the seed of knowledge

By achieving complete student participation and understanding throughout the learning process, the new TUTOR system saves valuable training time . . . cuts down supervisory routine . . . assures complete, uniform instruction . . . constantly measures student progress.

For details on this most effective new method of teaching in 2000 years, contact our training systems specialists, or write for TUTOR Data File AF-971-1.

USI

Western Design

Div. of U.S. Industries, Inc.
Santa Barbara Airport
Goleta, California

It is gratifying to see space given to the "earthy" discussion by Governor Hoegh. Certainly we depend upon our armed forces for military defense, but the Office of Civil and Defense Mobilization, under the Governor's leadership, is cutting a challenging pattern for civil activities toward survival.

James H. Garner
Acting State Coordinator
Defense and Disaster Relief
Austin, Tex.

Gentlemen: The article by Mr. Hoegh in the November issue quite possibly was never expected to be equated with the recent congressional disclosures in regard to TV and radio programming and advertising. However, the basic lessons of both should be remarked.

Mr. Hoegh points out that the *responsibility* must ultimately rest with the individual citizen if we are to have a successful civilian defense program. The present lack of this sense of responsibility is our problem. The very same responsibility becomes the only justification for an attempt to save anything in the first place.

Without an acceptance of personal responsibility for *all* our actions, and an insistence that each contact we make be based on the principle of individual integrity which sees a job completed no matter what the personal cost, we can never hope to have successful lives, or civil defense, or national defense.

Derek Van Dyke
Phoenix, Ariz.

Ed Wilson

Gentlemen: Your memorial to Ed Wilson on page 16 of AIR FORCE for November rolls back what seems like so many years.

I'm sure that many of us who served in his 8th Bomb Squadron, 3d Bomb Wing, will always remember him with a great deal of affection and respect.

In August of 1952, quite a few of us had finished our B-26 tours and were returning Stateside. The night before we left Iwakuni we had a going-away party which was attended by the whole squadron with Wilson presiding.

The following morning, those of us lucky ones had to be at the flight line for an early morning takeoff to Tokyo for our return trip to the States. Some of us "borrowed" Ed's jeep. His last words, after he breathlessly reached the line, were, "It's not too late to get you off those orders." But his naturally good spirit returned, and he wished us all a safe journey home.

His Silver Star award was given for a mission he flew in Korea, and on which flight I flew as his navigator. He deserved the medal.

No matter where Ed is at rest, his earthly life has been, and still is, recognized. I for one will miss him.

Capt. H. E. Scarborough
Truax Field, Wis.

UFO Icebreaker

Gentlemen: I am delighted to congratulate SPACE DIGEST and AFA for finally giving some attention (other than merely reprinting Air Force handouts) to the subject of Unidentified Flying Objects or so-called "Flying Saucers."

The article by Donald Robey of Convair in the November issue is a welcome addition to the too-small file of intelligent, well-thought-out studies into possible solutions to the flying saucer mystery. As a longtime UFO investigator and writer, I think it is about time such thinking is being done, and also about time SPACE DIGEST broke the ice! Robey himself is clearly aware that even if his theory is correct . . . it covers but a small part of the question of UFOs. I for one would heartily welcome further intelligent approaches to this subject from scientists, astronomers, aeronautical engineers, etc. . . .

It is my hope intelligent approaches to this subject, shedding it of the "little men" and "great beings of advanced races" with all their spurious ramifications, will convince the Air Force itself that an open hearing of the question is not only desirous but propitious. Secrecy and censorship, coupled with ridicule, have no place in the solution of a scientific enigma when it is obvious security is not involved.

Lee R. Munsick, Editor
UFO Newsletter
Morristown, N. J.

History of P-51

Gentlemen: I am an air historian and doing research on the North American P-51 Mustang fighter aircraft which was widely used by the USAF and RCAF for a number of years. Consequently, I wish to get in touch with personnel of the USAF who have or have had direct contact with the airplane; i.e., pilots, ground crew, etc.

I would like to contact persons with photographs of any kind of the P-51, military or civil models, or having any information pertaining to Air National Guard use of the Mustang. I will buy, trade, or borrow material.

Kenneth A. McLean
American Aviation Historical Society
185 Lanark Street
Winnipeg 9, Manitoba, Canada

AIRPOWER in the news

Claude Witze
SENIOR EDITOR

Election Year Outlook

WASHINGTON, D. C.

The curtain has risen on 1960, a presidential election year. Dwight D. Eisenhower, who wants to go down in history as First in War and First in Peace, would like to win both titles before 1961 rolls around. The public opinion polls, for what they are worth, show he still has an aura about him, but they do not show that anybody, even Richard Nixon, can step into that light. The discouraging thing is that there are few signs that the American people want to be disturbed by anything that is realistic, and it seems to be a safe bet that nobody, not even a presidential candidate, wants to disturb them.

True cynics can have a field day in town this winter. The Democrats, who did not distinguish themselves in the last Congress despite some fine opportunities to do so, have broken into print with 10,000 words of advice on how to draft the 1960 party platform. It has been coldly received, even by the people who would like to jump up and down over soothsaying by the Democratic Advisory Council. The blueprint points out all the things we need that have not been provided, including those in the area of national defense. But it fails utterly to suggest that we should build up a list of even minimum requirements, decide how much they will cost, and then face the music.

At this writing, with Santa shaking his bell over an iron pot outside the F Street department stores, the Republicans act as if they expect no great hindrance to continuing in power. This appears easy for them to do within the light of Mr. Eisenhower's good-will tour and the forthcoming gathering at the Summit. As long as they don't look, the GOP leaders do not see Nelson Rockefeller, who has proved to be a realist as Governor of New York and who appears to have some reservations about the GOP's national stature.

Against this backdrop it is hard to be optimistic about the issues that will be batted around this year. Those of us who feel that national defense and related technological contests with the Communist world are paramount are almost certain to get lost in the rush. Even Stuart Symington, who ran up a commendable record as Secretary of the Air Force a few years ago, is talking like a farm and financial expert. He has not dismounted from the defense horse, but he certainly has cut the mare down to a walk.

The space program—both military and civilian—unification of the armed forces, and air defense share the spotlight with general disposition of the military budget as potential issues in 1960. But how will they stand up in public interest and as topics for discussion on the television soapbox? If you want to know, review the letters to the editor of your local newspaper a month ago—in early December. In Washington, at least, there were a couple of daily readers indignant because their favorite disc jockey had been thrown off the air for conduct becoming a streetwalker. The rest of the crowd was writing about birth control. If national security can become an issue in this atmosphere, Calvin Coolidge was a Communist.

This does not mean that the Air Force can sit back and expect that the Department of Agriculture, the broadcasting industry, and the advocates of planned parenthood will have a monopoly on the witness chairs in Congress this year. There most certainly will be a lot of attention given to subjects close to USAF, but few of them hold any great potential as political issues in 1960. The blame for this situation must be laid to public complacency and the Republican success in stirring up the so-called "peace issue," which Joseph Alsop says is as phony as a three-dollar bill.

At the top of the list stands the space program, both civil and military. Senator Lyndon B. Johnson, Texas Democrat, is chairman of the Aeronautical and Space Sciences Committee in the upper chamber. He is generally recognized as a candidate for his party's nomination this year, a distinction he shares with Mr. Symington, who also is on the committee. There are some who feel this rivalry within the family is what has led to the overshadowing of the Missouri senator. Mr. Symington once conducted a highly competent investigation of the defense effort, and the transcript of those hearings still may be the best textbook extant on the general subject. Yet if there is political capital to be made out of the space effort—or lack of effort—you can count on it, Senator Johnson will wind up in the driver's seat.

On the House side the committee picture is more confused. Overton Brooks, Democrat of Louisiana, heads the group concerned with Science and Astronautics. Unlike the situation in the Senate, there is in the House the question of possible rivalry between Mr. Brooks's group and the House Armed Services Committee, which is bossed by the doughty and competent Carl Vinson of Georgia. Mr. Vinson is not on the Brooks committee, and it should be kept in mind that in the Senate Richard B. Russell, also from Georgia, *is* a member of the Aeronautical and Space Sciences Committee headed by Mr. Johnson, who, in turn, sits on Armed Services. The significance of this difference in how the chairs are occupied lies almost entirely in the fact that Carl Vinson is a highly sophisticated character. He knows more about the Pentagon than almost anybody who works on that side of the Potomac. The man is rightly proud of this fact and correctly jealous of his prerogatives so far as military affairs are concerned. There has been at least one occasion when he rapped the knuckles of Overton Brooks when it looked as if Science and Astronautics was about to steal some jam from a cabinet in the kitchen of Armed Services.

If these circumstances are important it will become evident if and when there is an effort to set up a Military Applications Division in the National Aeronautics and Space Administration. This proposal is getting serious consideration in some circles, but it should be added that the circles seem to be growing smaller and the consideration less

serious. One of many reasons for this declining enthusiasm is that Carl Vinson is not likely to let House jurisdiction of military space programs slip away from Armed Services. The other side of the coin is that NASA, as the civilian agency, lies in the domain of Overton Brooks, and it has been pointed out to the gentleman that if NASA gets a real military mission his domain will be divided. All in all, there is little prospect that the major-domos in the lower house will favor this kind of unification in space.

Another and seldom-mentioned factor is the provision of the Military Construction Authorization Act for fiscal 1960 that will require an annual authorization for the procurement of ships, aircraft, and missiles. This law says that starting January 1, 1961, no funds can be appropriated for this kind of procurement unless it has been authorized by specific legislation passed after January 1, 1961. Credit for this procedure generally is given to Senator Russell. It happens that Mr. Russell is on the Appropriations Committee in addition to his seats on Space and Armed Services. Thus it becomes apparent that he will get at least two cracks at any proposal involving vehicles, as will Mr. Johnson. But Mr. Russell is the man who heads Armed Services, and that is the committee which must authorize under the new law.

To most observers on Capitol Hill the setup means that anyone who tries to make political capital out of the space situation will have a hard time delivering on any promises unless Mr. Russell thinks the promises should be fulfilled. This applies, of course, to any proposal for the creation of a Military Applications Division in NASA.

On top of this there is the Administration viewpoint. This is a subject that has been scrutinized by AIR FORCE/SPACE DIGEST in the light of our continuing examination of the national space effort in this magazine. It is true that a plethora of boards, committees, councils, agencies, and departments have an interest in the program and a role as well. But it is the opinion of the Administration that to say all of them are running the program is a good deal like the late Senator McCarthy's count of Communists in the State Department. The program is being run by NASA and the Defense Department, period. It is true that NASA has taken over the big booster development and that the military must go to the agency for what they need in this field. But NASA's position is that it has no ambition to get into the supplying of any additional space equipment. NASA feels that the end result must be a relationship much like the one that existed between the military services and the old National Advisory Committee for Aeronautics. This precludes any effort of NASA to tackle military roles and missions.

USAF fears that its aerospace mission may be trampled in the rush to get things under a single head thus appear to be grounded more in what *might* happen as a result of the political ambitions of individuals than in any deliberate Administration effort. Lt. Gen. Bernard A. Schriever, chief of the Air Research and Development Command, has expressed the Air Force viewpoint in forceful language *(see page 66)*. Not long after he delivered his opinion, USAF's Maj. Gen. Don R. Ostrander *(see cut)*, himself long an ARDC officer, was moved into NASA as Director of Launch Vehicle Programs. His previous assignment was in the Pentagon with the Advanced Research Projects Agency, an office that clearly has outlived its usefulness and is generally believed to be on the way out. Both of these developments—the appointment of General Ostrander and the further fading of ARPA—most certainly represent victories for General Schriever's approach and his insistence that the military capability must be recognized.

It is high time that someone clear the air of this chatter, common a month ago, that there should be some kind of a parallel between NASA and the Atomic Energy Commission. This is a concept that has been promoted by several persons, including Vice Adm. J. T. "Chick" Hayward, a Navy weapons expert; and John A. McCone, AEC chairman.

Maj. Gen. Don R. Ostrander, who is NASA's new Director of Launch Vehicle Programs.

The parallel is badly strained. In the case of AEC the agency had a monopoly on the supply of materials used to produce useful forms of atomic energy. AEC had the *only* facilities for processing this material and the *only* know-how. This was handed to AEC in one basket, the Manhattan District, when the Commission was set up. There was no competition or diffusion of effort. So far as the Defense Department was concerned, it was AEC's job to provide atomic bombs—or other warheads—and the military services, primarily the Air Force, found a way to deliver them. AEC, in short, was and is an explosives maker. In some cases the technique has been expanded or improved to the point where the agency is interested in propulsion systems for submarines or rockets, but again AEC is in these areas because of the basic monopoly it holds with the material.

If we turn now to NASA and space-technology operations we find an agency that has used, almost exclusively, hardware developed and produced by and for the military. Most of its rocket boosters came from the IRBM and ICBM programs. This will continue to be true for some years to come, even with the development of new upper stages. On top of this the military services initiated a great number of the satellite and space-probe projects now in NASA. The Air Force alone can list many of them that were born and bred in USAF's mental exercises in preparation for the aerospace era. Beyond the hardware are operations, and here the parallel between AEC and NASA collapses entirely. Military operations always will be military and civilian operations civilian. The whole picture is looked upon in NASA as one of "nonparallelism" to the AEC-Defense Department relationship.

Unification Also on the Agenda

When the Defense Department Reorganization Act of 1958 was in the mill, the Air Force Association said it favored the changes as a step in the right direction but lamented the bill's failure to reach for real and complete unification. Well, the subject will be back in the hopper this year, but nobody anticipates anything but dis-

(Continued on page 15)

...AT U.S. NAVY'S DAVID TAYLOR MODEL BASIN

FASTEST COMPUTER READOUT MICROFILM PRINTER IN USE TODAY!

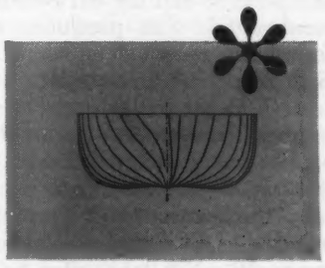
FIFTEEN THOUSAND plotting points or alphanumeric characters per second are being recorded *now* on the Stromberg-Carlson S-C 4020 high-speed microfilm printer at the U.S. Navy's David Taylor Model Basin in Carderock, Md. Either on-line or off-line operation is provided.

At the David Taylor Model Basin, the S-C 4020 is used in the applied mathematics laboratory for the solution of various Naval problems including ship design, hydrodynamics, structural mechanics and nuclear reactor design. It is ideal for all kinds of high-speed computer printing, filing and archive storage.

In typical graph plotting applications, the S-C 4020 can save as much as $4,840 a month. Assume that an average of 2,100 graphs with 375 points each are required each month. Twenty-five engineering aids can do this work by hand at an estimated cost of $8,800 a month. One S-C 4020 high-speed printer can do the same work for a capital expense of $3,960 —a saving of $4,840 a month.

Printers similar to the one in use by the U.S. Navy are coming off the production line right now. You can have your own printer saving hundreds of valuable man-hours within 6 months.

LITERATURE AVAILABLE —Write to Dept. A-20, Stromberg-Carlson-San Diego, 1895 Hancock Street, San Diego 12, California.



Selected data, either tabular or graphic, may be projected on the accessory viewing screen only 8 seconds after film exposure. The projection unit is useful for computer monitoring.

STROMBERG-CARLSON-SAN DIEGO

A DIVISION OF **GENERAL DYNAMICS CORPORATION**

cussion. The candidates-to-be will use the failings of the 1958 law to badger the Administration, and they will get some ammunition from retired officers who have written books or magazine articles.

The Armed Services Committees have an interest, and so does the House Committee on Government Operations, whose Mr. Chet Holifield, a Democrat from California, has suggested that the Army and Air Force should be remarried. Rep. Frank Kowalski, another Democrat who hails from Connecticut, is talking about a bill that should be close to the AFA concept, calling for a single service and a single uniform. Mr. Kowalski, who is looked upon by the military as something approaching a nuisance, has to his credit a commission from West Point and a degree from the Massachusetts Institute of Technology. He has written a letter to the new Secretary of Defense, Thomas S. Gates, Jr., proposing that there be an immediate merger of missile programs. Mr. Gates, who once was Secretary of the Navy, has, however, shown an inclination to support the Navy's view in this area. It is a view that does not favor further unification.

Congressman Paul J. Kilday, a Texas Democrat who ranks next to Chairman Vinson on the House Armed Services Committee, has predicted that there will be a lot of talk about another reorganization but there won't be any law passed. This seems entirely reasonable because the Eisenhower Administration would have to admit shortcomings in its 1958 program if it seeks more changes. As for the Democrats, they can go through 1960 yelling from the soapboxes that they gave Ike what he wanted two years ago and argue that the way to have things done right is throw the rascals out. This probably means that unification will be an issue of sorts in Washington and that it will take up a lot of committee time. But if the Eisenhower-Khrushchev peace offensive keeps rolling it will not be an issue on which votes are made.

Hebert Will Carry On

The perennial study of weapon system procurement will be continued by the Subcommittee for Special Investigations of the House Committee on Armed Services. This group, headed by Rep. F. Edward Hébert (D.-La.), will have a report on last year's sessions out for study before this issue of AIR FORCE/SPACE DIGEST is off the press. It is anticipated that the committee, which said it was looking for possible inadequacies in the laws governing employment of retired military officers, will come up with some recommendations. They will be concerned with the rules forbidding dual compensation, which effectively keep a retired officer from working for the government in a civilian capacity. The committee also is expected to suggest more uniformity and common sense in these and other regulations such as the one under which a couple of retired Navy officers were docked because they promoted beer sales among sailors.

Mr. Hébert will introduce corrective legislation, and there will be some more hearings, probably by a special subcommittee headed by Representative Kilday. The witnesses in this case are expected to come from some of the federal departments. They will be asked how they propose to utilize the talents of retired military men once the restrictions are eased. Interests of the career civil-service workers will have to be protected and some solution found to the problem of the retired officer who starts building up an equity in a second retirement system.

So far as industry employment of retired officers is concerned, it appears that the Hébert Committee now recognizes their contribution to the industry effort as part of the defense team. The existing rules face some change, but it is not anticipated that they will be made more stringent. Criminal statutes, the committee appears to believe, have little application and there is no pressing need for them to be altered. Likewise, there is no indication that the committee will offer any recommendations on matters involving the allowability of certain costs by the Internal Revenue Service or the procurement regulations.

The Hébert Committee's attention will not swerve from the general subject of weapon system procurement. There is a strong possibility that it may give some attention to the complaints of small business and look into its role as a supplier for the Defense Department.

Other Topics on the Agenda

Appropriations Committees of both houses, as well as the House Government Operations Committee and Senate Committee on Interstate and Foreign Commerce, will join in prolonged examination of the Military Air Transport Service. This is an area where USAF faces a tough fight. The Air Transport Association, trade organization of the commercial airline operators, is in the vanguard of the attack. This is well known to Congress, and it should result in more careful examination of the facts than ATA has condoned in its highly successful effort to win editorial support around the country.

It is unfortunate that the budget situation lends itself so readily as an ally of MATS's enemies. The assault is concerned with the proper role of military and civilian air transport in peace and war, a field in which USAF can defend its requirement. But the money angle then interferes, and the necessity for modernization of the MATS fleet seems to run head-on into the airline determination that if Uncle Sam is going to invest dollars in this kind of equipment the airlines want to share in the benefits.

There are some men in Congress, such as Senator A. S. Mike Monroney, Oklahoma Democrat, who have strong opinions on the subject of MATS, holding that USAF has been derelict in its modernization plans. Senator Stuart Symington has expressed similar sentiments. In the House, one of the more complete studies was conducted by a special subcommittee of the committee on Armed Services, headed by Congressman Paul J. Kilday of Texas. In these sessions there was a good deal of talk about a published accusation that Air Force Secretary James H. Douglas had blocked a program under which the commercial airlines would get guaranteed loans to buy more modern all-cargo aircraft. Mr. Douglas was defended by the office of the Secretary of Defense, which said the rumors in print were not true. Now that the Secretary has moved into a new position as Deputy Secretary of Defense he presumably will be in a better position to have his opinions heard. At this writing, there is a White House study of the military airlift problem in the works. The great danger here is that the airlines and the Bureau of the Budget will have more to say about the recommendations than the Joint Chiefs of Staff.

Almost every committee that has an interest in our military stature will probe, to one degree or another, into the over-all air defense, missile, and manned aircraft situations. The Nike-Bomarc controversy has by no means cooled off. There will be a lot of questions about our ability to meet the ICBM threat, the role of the manned interceptor, and the significance of the cancellation of the Mach 3 F-108. The mixed-force concept will be examined in the light of

(Continued on following page)

the fate of the B-70 program, discussed at length beginning on page 29 of this issue.

Like the space problem, these are areas affecting our full military posture, and they should be fruitful of genuine issues for the upcoming campaign. Indeed, they are critical although they lack the glamor of the space race. Unlike the situation in the space race, the problems for the most part are budgetary rather than technological. We know how to build Mach 3 aircraft, and we need them. There is no gap, in missiles or aircraft, that can't be filled if we want to fill it, but we have a fixed ceiling on spending in the midst of an exploding technology.

The budget situation was reviewed earlier in these columns, and there is further reference to it this month in "Aerospace World" on page 22. As we go to press, Mr. Eisenhower is being cheered in India as the "Prince of Peace," and he has orated to the parliament in New Delhi on the themes of peace, disarmament, racial equality, and mutual trust. "The President made no mention," reported the New York *Times*, "of the threat to India that has been posed by Communist China."

At home, Mr. Eisenhower's Administration is convinced that we can't afford more than a little more than $41 billion for national defense. To meet rising costs it relies mainly on the stretch-out technique, which is designed to delay introduction of the weapon regardless of how soon it is needed. In this connection, it is significant that one of USAF's most successful current projects is the North American Hound Dog, a standoff missile with a range of about 500 miles that will help the B-52 do a better job. The Hound Dog is just about the only important weapon—really a subsystem—that has *not* been stretched out. Now that the B-70 program has been gutted and the B-58 stretched until it is almost broken, Hound Dog may be the brightest light in SAC's mixed force. This is because the emphasis has been maintained.

Putting realism into the program would cost more money and presumably increase taxes. It is unlikely that any political candidate will prepare himself to stand on that kind of a platform. So far as we can see, the country faces continued peril while it looks in vain for courageous leadership.

McElroy, Gates, Douglas, and Sharp

Delivering his swan song at the Pentagon, Neil H. McElroy made some headlines with his disclosure that the fiscal 1961 budget will include money to prepare SAC for an airborne alert if it becomes necessary. This is the only method we will have to fill the "bomber gap" created by our spending policies. Generally, there was less attention paid to Mr. McElroy's parting remarks on the subject of the military assistance program, which also is included in the new defense budget. The retiring Defense Secretary, clearly aware of the glum talk coming from Europe about the problems facing NATO, said he felt it imperative that the American people lend support to the military assistance program for the selfish purpose of ensuring their own security. He said there must be found a way to "make it believable" that dollars spent arming our allies are like dollars spent on our own weapons.

One of our more iconoclastic friends of the daily press corps then asked Mr. McElroy, who now is back in the business of selling soap and shortening, how he can sell the public on military assistance abroad while convincing it there is not enough money to take care of the military requirement at home.

In his reply the outgoing civilian defense chief tossed the ball to the military chiefs of staff. The generals, he said, given the choice, would prefer to see military assistance abroad to "further enhancement of the United States military budget." So far as we know, nobody has quizzed the Chiefs of Staff on this in the terms used by Mr. McElroy. The anecdote is worth relating for more than the emphasis it puts on the importance of our aid to our allies. The failure of this retiring executive to answer the question somehow typifies his career in the Pentagon. He entered the scene more than two years ago with a blaze of something that was refreshing after the innate conservatism of Charles E. Wilson. He reversed a number of Wilson decisions, was generally hailed for reacting with vigor to the first Russian Sputnik, and made friends to the right and left. There even was talk that he was presidential timber. By the time of his retirement last month Neil McElroy was ready to leave quietly, and there was no gnashing of teeth over his return to consumer business. The full truth is that the Administration, by its fiscal policies, makes it impossible for any man to do a good job in the DoD slot. If there was a newspaper story or a single editorial or a speech that pointed this out, the editors of AIR FORCE/SPACE DIGEST have not heard about it.

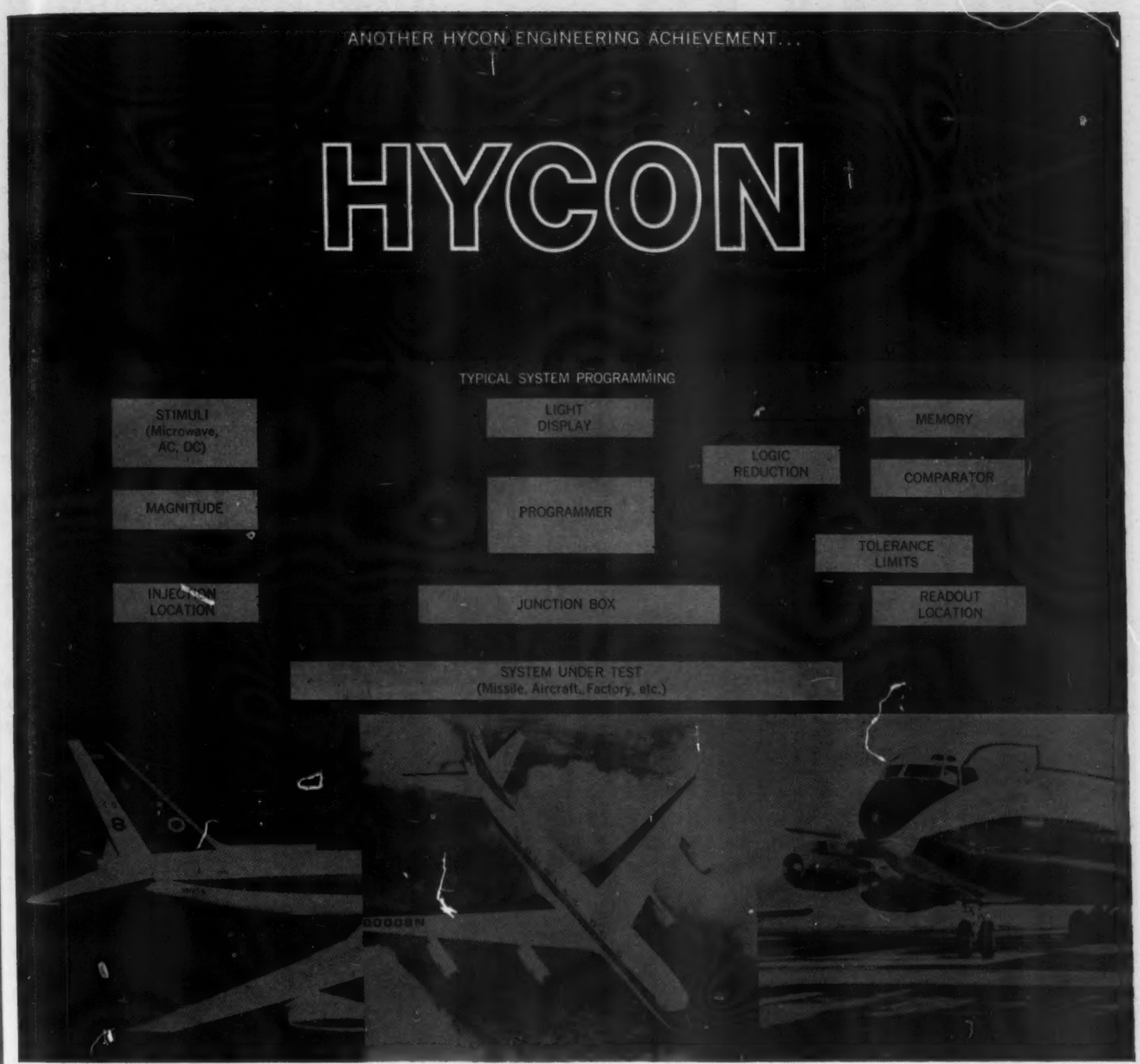
James H. Douglas, left, former Air Force Secretary, now is Deputy Secretary of Defense. His replacement as top Air Force civilian leader is Dudley C. Sharp, at right.

Mr. McElroy was succeeded by Thomas S. Gates, Jr., a big, amiable man from Pennsylvania. We are certain he is just as vigorous and competent as Neil McElroy but can see little need to discuss his viewpoints or his ability under the circumstances. There are some people around town who suspect that he may be a more independent thinker than his two predecessors. We hope so.

For his deputy, Mr. Gates chose the Secretary of the Air Force, James H. Douglas, who hails from Chicago and has been around Washington, off and on, since 1932. He is an Air Force veteran and served as a colonel in the Air Transport Command during the war. His background will serve well in balance with that of Mr. Gates, who has Navy experience, in and out of uniform.

The new Secretary of the Air Force is Dudley C. Sharp, of Houston, Tex. In mid-1955 he was made Assistant Secretary of the Air Force for Materiel, went home for a short time last year and then returned to the Pentagon as Mr. Douglas' top aide. Mr. Sharp, like Mr. Douglas, is a graduate of Princeton. In private life he was head of the Mission Manufacturing Company in Houston, Tex.

In his years as USAF Assistant Secretary for Materiel, Mr. Sharp became familiar with the aircraft and missile industries. He thinks they can do a better job.—END



Universal Pre-Flight Automatic Test Systems

6 Times Smaller, 6 Times Lower in Cost Than "Custom" Units

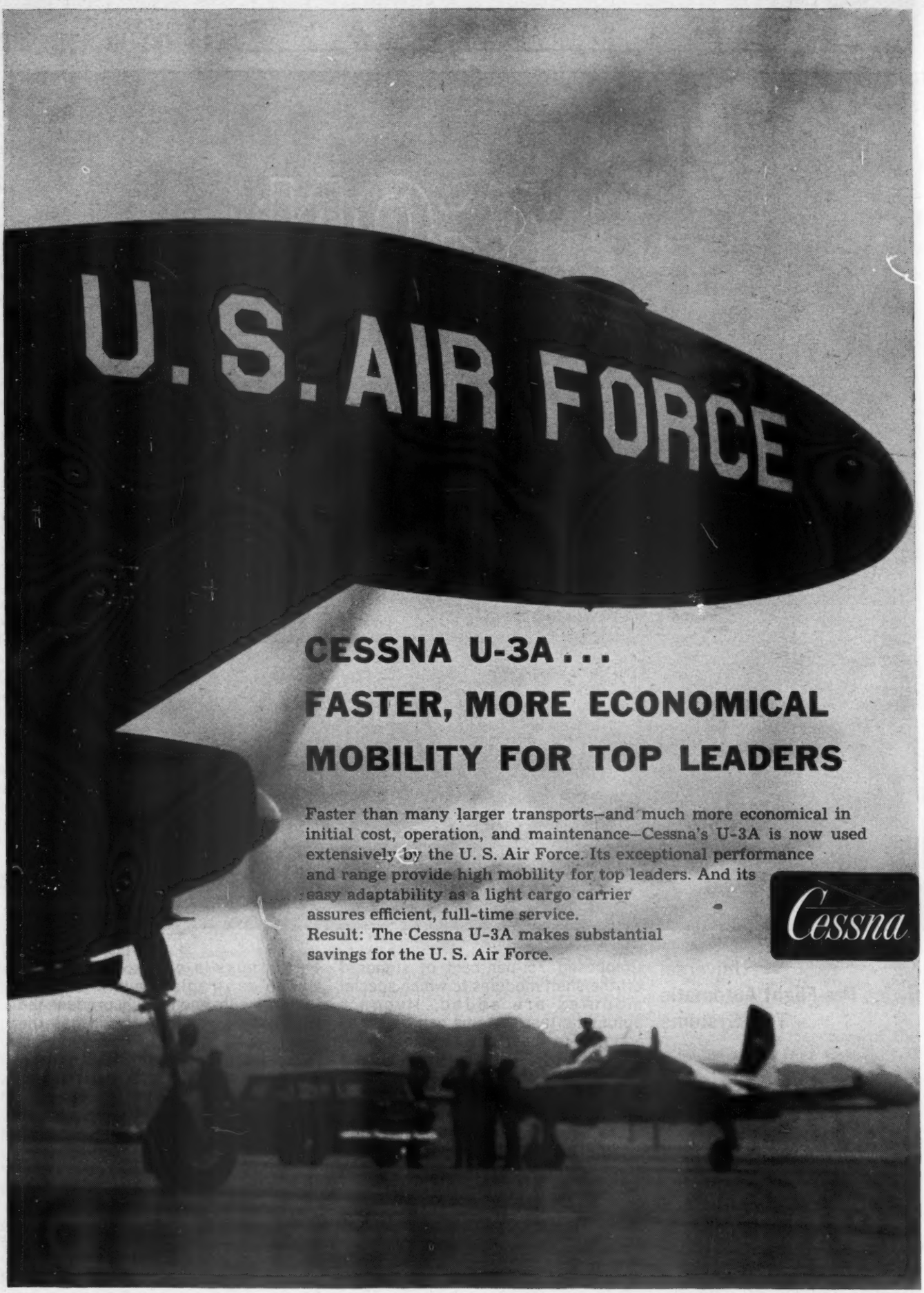
Composed 75 per cent of standard off-the-shelf modules to which special modules are added, Hycon's automatic test systems can be easily adapted to meet one checkout need after another. Use them for ground checkout of commercial aircraft, military aircraft or missiles. Assemble modules to test a complete system or a single function. Typical applications include checkout of autopilot, communications, hydraulic systems, radar, power plant, flight controls and flight instrumentation. If your requirement is limited, buy only the modules you need.

Now in full production on Terrier and Tartar missile checkout systems, Hycon can rapidly evaluate your requirements and quickly produce the equipment you need. Hycon has the experience and the facilities to undertake research, development and production-line output of test systems for any missile, aircraft, electronic or industrial system. Please write for technical literature.

Hycon Mfg. Company

1030 Arroyo Parkway, Pasadena, Cal.

Specialists in research, development and production of automatic test systems, aerial reconnaissance systems and communications systems.



CESSNA U-3A . . .
FASTER, MORE ECONOMICAL MOBILITY FOR TOP LEADERS

Faster than many larger transports—and much more economical in initial cost, operation, and maintenance—Cessna's U-3A is now used extensively by the U. S. Air Force. Its exceptional performance and range provide high mobility for top leaders. And its easy adaptability as a light cargo carrier assures efficient, full-time service.
Result: The Cessna U-3A makes substantial savings for the U. S. Air Force.

Cessna

INQUIRE TODAY ABOUT THE REWARDING CAREER YOUR AIR FORCE OFFERS YOU

What's New With ★ RED AIRPOWER

Here's a summary of the latest available information on Soviet air intelligence. Because of the nature of this material, we are not able to disclose our sources, nor document the information beyond assurance that the sources are trustworthy.

A recent Russian attempt to buy stainless steel in this country points up the little known fact that the USSR does not produce stainless steel on its own. Small amounts of the heat- and corrosion-resistant metal are made in the East European satellites, however.

Russia needs stainless steel for high-speed airplanes (over Mach 2.2) and probably for rocket exit nozzles. The United States' developmental B-70 bomber, designed by North American Aviation, will have a skin substantially of stainless steel to withstand the heat of air friction encountered at Mach 3 and above.

The US turned down the Russian request to purchase the steel.

• • •

The battle for engineering manpower goes on. Russia famed Russian-born, English-trained Soviet physicist. The 35,000 that year. Comparative quality of training received remains open to question.

• • •

Some sixty IL-18 turboprop transports are now in service on Aeroflot Soviet airline routes, including routes from Moscow to London and Moscow to Prague. Here are some of the aircraft's specifications:

Cruising speed, 405 mph.; maximum speed, 472 mph.; gross weight, 137,000 lbs.; takeoff distance, about 4,600 ft.

The aircraft can fly 2,800 miles with full load and have an hour's fuel reserve. It carries in normal configuration seventy-five tourist passengers, sixty in the rear of the cabin and fifteen up forward. Seating is two abreast on one side, three abreast on the other. A large galley is located amidships, similar to the TU-104 arrangement. Crew includes pilot, copilot, navigator, radio operator, and flight engineer on international flights. There usually are three stewardesses.

• • •

Among those in the Russian Antarctic expedition in 1958, it now is learned, was Peter Kapitsa, Jr., son of famed Russian-born, English-trained Soviet physicist. The senior Kapitsa is associated with Soviet space programs and nuclear research.

• • •

Russian designer Boris Gavrilovich Shpitalny, who designed a number of Soviet aircraft weapons used in World War II, has reportedly come up with a new engine design. The engine is said to develop tremendous horsepower. It is very light in weight. Special design techniques for the combustion chambers avoid predetonation. No special fuel additives are required. The engine will run on gasoline, kerosene, and even natural gas.

No sketches are available, but the engine is said by the Soviet press to have pistons that operate without touching cylinder walls. Fuel consumption is very low in terms of power output, and the engine has a very low weight-to-power ratio. So far only a test model has been built, but based on this model, the new powerplant is regarded as suitable for small and medium aircraft.

• • •

In Russia there are more unpaved airfields than paved. This presents special operating problems. *Sovetskaya Aviatsia* (Soviet Aviation) commented recently on the fact that interceptors flown from bare fields encounter special operating problems.

When fighters take off and land on muddy fields, it was said, "mud and water get into the landing gear locks and into the openings through which the struts supporting the auxiliary fuel tanks pass. At flying altitudes the moisture freezes and may crack the tanks. The landing gear may fail to operate for the same reason."

To cope with these problems, Soviet fighter aircraft are given a coat of grease in and around the openings for the auxiliary tank struts. The locking mechanism for the landing gear also is greased. In summer, when unpaved airfields usually are dusty, these surfaces must be cleaned and regreased regularly.

Landings and takeoffs over rough ground also cause many leaks in lubrication, fuel, and hydraulic systems, and often upset the transducers in the gyrocompasses. To overcome these problems, special care is taken during preflight inspection to find leaks and to check out the gyrocompass.

• • •

As part of their program to decentralize science and industry so that they are not so concentrated in Moscow and Leningrad, the Soviets are making Tashkent an important atomic research and development center. Recently several hundred Soviet atomic scientists gathered there for a conclave on atomic energy.

• • •

Medium and small transports are receiving increasing emphasis from behind the Iron Curtain, especially in the satellite countries. The USSR seems to have the large jet and turboprop market pretty well to itself, with the possible exception of some competition from East Germany. But in the medium-small field Russia is somewhat behind its satellites in the development of new types of aircraft.

Poland has come up with the latest medium type, a twenty-passenger transport for short-range use. Designated the MD-12, it is powered by 350-hp. piston engines and has a range of just under 300 miles. It is interesting that fuel capacity limits the airplane to about two hours of flight time.

The Czechs have come up with a new twin-engine airplane suitable for five passengers. It is designated the L200 Morava A and is built by the Czechoslovakian National Aircraft Works at Kunovice. It has a range of about 1,000 miles, and several have been purchased by the USSR for Aeroflot's ancillary services, such as crop dusting, ambulance work, and transportation to small remote communities.

• • •

Half of the people who fly with Aeroflot ride in turbine-powered aircraft these days. Next year the Soviets expect to raise the figure to seventy percent, and by the end of the present seven-year plan, in 1965, they say everyone who travels over 300 miles by air in Russia will fly in turbine-powered planes.—END

News, Views & Comments

AEROSPACE WORLD

THE AEROSPACE WORLD

● A jet aviator calmly presses the panic button in his McDonnell F-101 fighter and spends the rest of Thanksgiving Day bobbing around in the chill North Atlantic.

● A rhesus monkey named Sam and a cargo containing flour beetle eggs, rat nerves, and cell tissue take a quick fifty-five-mile trip—straight up.

● Elements of North American F-100 Super Sabre tactical fighters streak on instant orders from South Carolina to France in a new display of swift deployment capabilities.

● A Boeing B-47 bomber crisscrosses over the United States for more than three days and nights before putting down—having accumulated a hatful of equipment data besides setting a jet airborne endurance record and a jet nonstop distance record.

● Fifteen miles above the New Mexico desert, a thirty-one-year-old Air Force captain leaps from a balloon-borne open gondola and descends to earth in history's longest parachute jump.

These are among the spectacular events of the month's aerospace story. Another contrasting portion of the story is enacted around conference tables, in budget sessions, and at press conferences in the nation's capital.

At USAF's "big hangar" on the south side of the Potomac, general attention is riveted on planning and policy problems raised by Administration budgetary concerns. The economy knife cuts deep.

Even Santa Claus suffers. A Defense Department memorandum a few weeks before Christmas denies the use of government air transportation to Santa Clauses involved in such activities as base parties, community programs, and so forth. The helicopter in the past seemed an ideal *deus ex machina* for these Santa Claus appearances.

"It is believed advisable," the memo tells the services, "to remind all commands that such use of government aircraft is not authorized."

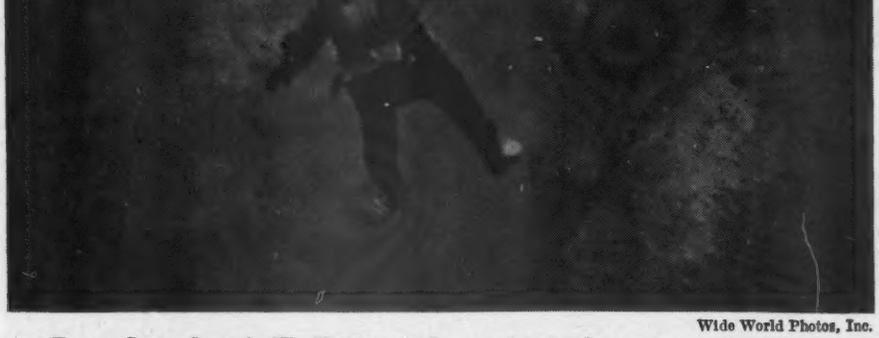
With these diverse but related items, AIR FORCE/SPACE DIGEST kicks off AEROSPACE WORLD, a monthly report of news and views. Merged in this new feature are three magazine departments, "Flight Lines," "Views and Comments," and "Shooting the Breeze," as well as the Air Force film listings that first appeared last month ("USAF on Film").

☆

Man thrusts higher and higher into space—and learns to come back. Air Force Capt. Joseph W. Kittinger, Jr., added a new page to the record book on November 16.

Captain Kittinger, of ARDC's Aerospace Medical Laboratory at Wright-Patterson AFB, jumped (*see cut*) from

Wide World Photos, Inc.



Wide World Photos, Inc.

Air Force Capt. Joseph W. Kittinger, Jr., made the longest parachute jump in aerial history on November 16, leaping from balloon gondola 76,400 feet over New Mexico. Above, first few seconds of jump caught by fixed gondola camera.

Right, Captain Kittinger partially suited up for his high-altitude jump. He set three records in drop, ascending in open gondola higher than any man before him, free falling for just under three minutes before his parachute opened.

an open balloon gondola at an altitude of 76,400 feet, close to fifteen miles. The ascent had taken an hour and a half. Three minutes after he jumped, Captain Kittinger was back at 10,000 feet. Only then did his chute open, returning him in somewhat more leisurely fashion to the desert floor.

During the first three minutes, Captain Kittinger fell downward at speeds up to 450 miles an hour through temperatures as low as 104 degrees below zero.

"In those first few seconds," Captain Kittinger recalled afterward, "I was looking straight down at the earth. There was no sense of movement or falling—no noise, no wind, no vibration. It was as if I were in a state of suspended animation."

Fifteen seconds later, he was over on his back, "head slightly down," with the dark blue heavens and the now-empty gondola above.

His speed increased. He felt air rushing by. Three times he started rotating in flat spins. Unchecked, these could have exerted dangerous centrifugal forces on his body. Each time, by a kind of up-and-down scissors kick, he arrested the spin.

Back on the ground, Captain Kittinger, a native of Tampa, Fla., found that he had set three records. He had gone higher in an open gondola than any man before him, had made the longest parachute jump in aerial history. The period of free fall, two seconds under three minutes, also established a record.

The free fall part was actually more than the script originally called for. A small chute was to have stabilized Captain Kittinger's body from the time of jump until the main twenty-eight-foot one opened. But he caught his sleeve on the gondola door as he leaped. The delay caused the preset junior chute to foul on opening, leaving him on his own to 10,000 feet.

Captain Kittinger, who made the jump as part of ARDC work in the area of high-altitude bailout, came through his altitudinal experience in fine style. He wore a partial pressure suit and oxygen and protective devices, maintained consciousness throughout the descent, was all set for further jumps in the near future.

Extremely high altitudes are not new to him. He set a manned balloon record by reaching 96,000 feet in a sealed gondola on June 2, 1957 in the Air Force's Man-High I flight, receiving the Distinguished Flying Cross for the achievement. The record was broken in the second Man-High flight, in which Lt. Col. David Simons reached 102,000 feet, about twenty miles.

Previous record jump from a balloon was 51,000 feet by Swiss balloonist Auguste Picard in 1931.

☆

Time is history. A record-setting parachutist makes history in minutes. An ARDC B-47 approached the matter from the opposite tack at the end of November.

The plane took off from Wright-Patterson AFB, Ohio, at 3:13 on the afternoon of November 27. Destination: Wright-Patterson AFB. The Stratojet, with Capt. Sheldon J. Anthony at the controls, headed out across the Midwest. Soon the Great Plains passed far below, then the Rockies and the Far West. The plane turned, headed back over the continent.

All Friday night it flew, then Saturday and Saturday night, then Sunday and Sunday night. At 11:49 a.m. on Monday, pilot Anthony touched down once more at home base, Wright-Pat. The eighty hours and thirty-six minutes spent in the air constituted an airborne endurance record for a jet. The distance covered, 39,200 statute miles, over most of the continental United States, set a mark for nonstop mileage covered. The mileage was equal to one and three-fifths times around the world.

British Westland Westminster developmental flying crane helicopter hauls 103-foot bridge in United Kingdom test. Sikorsky S-60 flying crane is in development in the US.

Longest previous jet flight, also made by a B-47 on November 17, 1955, was eclipsed by some thirty-three hours. Ten years ago a propeller-driven B-50 flew 23,452 miles in ninety-four hours.

Purpose of the November 17 flight was to test new equipment. The plane belongs to ARDC.

☆

One of the neatest rescue operations of this or any year took place on Thanksgiving Day west of the Azores. Capt. James R. Stevenson of the Britain-based 78th Tactical Fighter Squadron was heading "home" to England in an F-101. An old hand at ferrying fighters across the Atlantic, he found himself running out of fuel—surprisingly, since minutes earlier he had refueled from an aerial tanker.

Captain Stevenson put his May Day call on the air, ejected, and found a rescue plane from Lajes Field on hand before he hit the water. The rescue plane dropped a raft, vectored in ships in the area. Four hours later the Norwegian freighter *Sungran* picked up the downed aviator.

He radioed Third Air Force Headquarters at Ruislip, England, "No sweat. I'm a lucky son of a gun, and I'm fighting fit."

Verdict on the incident was malfunction in the plane's fueling equipment.

☆

Sam the monkey helped pave the way for America's first Astronaut by a visit to the edge of space on December 4 (*see also page 59*).

Sam was sent on a thirteen-minute round trip in a capsule fired by a Little Joe rocket from the National Aeronautics and Space Administration's Wallops Island, Va., station. Sam's capsule rose to fifty-five miles over the Atlantic, parachuted down, and was picked up by the Navy destroyer *Borie*.

The test was carried out primarily to test operation of a high-altitude pilot escape system, part of Project Mercury's man-in-space program.

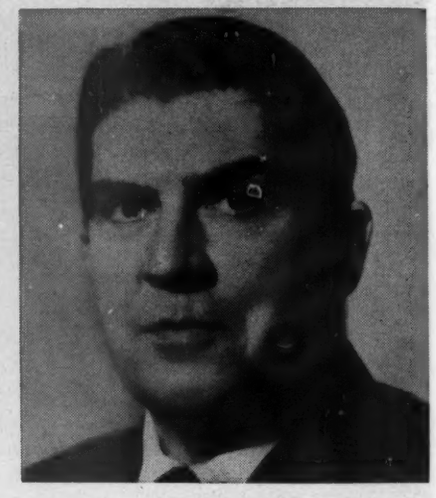
Along for the ride went such test items as nerve cells from a rat, barley, spores, bacteria cultures, a cell tissue culture, and eggs from a flour beetle.

The Wallops Island test was judged a "complete success." Sam, named for the initials of USAF's School of Aviation Medicine, now at Brooks AFB, Tex. (*see page 40*), was judged quite well when his capsule was opened aboard *Borie*. But he was hungry. Sam wolfed half an apple

(Continued on following page)

Outgoing Defense Secretary. Neil H. McElroy resigned the top DoD post on December 1, returned to private life.

Successor. Thomas S. Gates, Jr., who formerly served as McElroy's deputy, and Navy Secretary, took over job.



New Defense Comptroller. New York lawyer Franklin B. Lincoln, Jr., who took control of DoD's purse strings.

and half an orange, washed them down with a cup of water.

☆

In Washington, it was a month like any other month. The issue was money—the old sinew of war on which rests weapon development, force strength, strategy itself. At a time of weapons transition, when developmental and strategic problems were knotty enough all by themselves, the sinew was that much more binding.

The Administration's budget for fiscal year 1961, which begins next July, becomes public later this month when the President sends it to the new session of Congress. It was known to be a tight one, with military spending at a restrictive $41 million, same as for the current FY. This, in effect, was a cut in view of rising costs per item.

Aside from a B-70 program reorientation *(see page 29)* and Santa Claus, one case serious and the other symbolic, these were some of the results the budget was expected to have on USAF:

- A force cut below that already scheduled to bring the service to the 825,000 mark. It now stands at some 10,000 above that. Number of wings, now at 102, might also be pared.
- Greater reliance on missiles and less on manned aircraft—in other words, less of a double-barreled airplane-missile approach to defense. Priority funding was slated for the Minuteman solid-propellant second-generation ICBM, which should become operational in 1963. Heavy current reliance, according to Administration plans, was to be placed on USAF's operational Atlas ICBM and the Navy's still developmental submarine-launched Polaris. USAF's Martin Mace tactical missile program is also being stepped up.

On the other hand, the B-70 has been gutted, the North American F-108 interceptor was dropped a few months ago, the promising Convair B-58 Hustler program has not been given a final green light as yet, phaseout of a number of B-47 units has been advanced. In addition, deactivation of a handful of air-defense units, including four Lockheed F-104 Starfighter squadrons, and three bases had been announced at this writing.

At the same time, preparations moved ahead, it became known, for an airborne alert by Strategic Air Command planes. This was a matter of both training and hardware. If the Joint Chiefs of Staff decide on such an alert as a national security measure, additional engines and other maintenance materiel will be required. Funds for this will be available, it was said.

Announcement also came from the Air Force early in December of design competition in the new year for a fighter-bomber beyond TAC's potent supersonic Republic F-105. Contractors have been invited to submit designs in the near future. The plane, as visualized, would be in the above-1,500 miles an hour category, able to take off and land vertically. It would be USAF's first new drawing-board aircraft since the F-108 and B-70 programs were initiated. Most major aircraft concerns were interested.

☆

In tune with the march of events, "adjustment in the type of units and redisposition of military forces" overseas was forecast.

Gen. Thomas D. White, Air Force Chief of Staff, told the NATO Parliamentarians' Conference in Washington at the end of November that weaponry had changed radically since NATO was organized a decade ago, dictating such shifting: "The difference lies in the capabilities of the propeller-driven bomber compared with those of the intercontinental ballistic missile."

☆

Also at the top of the news:

Thomas S. Gates, Jr., succeeded Neil H. McElroy as Defense Secretary on December 2. Ten days later Air Force Secretary James H. Douglas moved into Mr. Gates's former post as Deputy Secretary of Defense. Air Force Under Secretary Dudley C. Sharp became new Air Force Secretary.

Mr. Gates had served as Mr. McElroy's deputy since June 8, was previously Navy Secretary. Mr. Douglas became AF Secretary in 1957. Mr. Sharp became an AF Assistant Secretary in 1955, Under Secretary in August 1959.

In another top appointment, New York lawyer Franklin B. Lincoln, Jr., succeeded retired Wilfred J. McNeil as Assistant Defense Secretary and Comptroller.

☆

- Navy Cmdr. Malcolm Ross, a veteran balloonist, and one crewman soared to 81,000 feet in a closed balloon gondola on November 29 and photographed the planet Venus. Their observations proved that Venus' atmosphere contains water vapor.

• On December 6, a Navy pilot set an unofficial world altitude record for a ground-launched plane, taking his McDonnell F4H carrier jet to 98,560 feet over Edwards AFB, Calif. The flight by Cmdr. Lawrence E. Flint of Beckley, W. Va., bettered a mark of 94,658 feet set by a Russian Air Force TU-431 in July. Earlier record of 91,249 feet was set by USAF Maj. Howard Johnson in an F-104 on May 7, 1958.

• First operational B-58 was turned over to the Air Force by Convair's Fort Worth plant, the old "home of the B-36," on December 1. This was the thirty-first Hustler built. The first thirty went to test programs. Immediate plans call for construction of one more B-58, bringing the total built to thirty-two. Three wings of thirty-six aircraft each are still called for in SAC's programming.

• A Composite Air Strike Force of tactical fighters, assault transports, and aerial tankers sped from the eastern United States to bases at Chaumont and Laon, France, in an exercise known as Spearhead from November 10 to 12. The planes were F-100 Super Sabres from Myrtle Beach AFB, S. C., Lockheed C-130 transports from Sewart AFB, Tenn., and Boeing KC-50 tankers from Langley AFB, Va.

• The F-104 took on an increasingly international hue. The West German, Canadian, and Japanese air forces have selected late models of the plane for air defense. It will be produced in each country starting in 1961.

• A production model of the Convair F-106A Delta Dart, incorporating new flight control, fire control, and data-link equipment, recently made its first flight. A pilot can, in effect, "lock on" SAGE system output shortly after takeoff and have many flight functions performed automatically until he is ready to land.

FLIGHT LINES

Veteran aviator Max Conrad set a nonstop lightplane flight record when he flew from Casablanca to El Paso, Tex., in fifty-six hours and twenty-six minutes in his Piper Comanche. He landed at El Paso on November 26. Previous mark of 4,957 miles in the same weight class was set by the late Bill Odom in 1949. . . . North of the border, Canadian Defense Minister George R. Pearkes revealed Canada will receive atomic warheads for Bomarc missiles and tactical weapons in line with agreement reached at the two-nation defense meeting at President Eisenhower's Camp David retreat last fall. . . . The Federal Aeronautics Agency dropped the maximum age for commercial pilots to sixty on December 5 from the former sixty-five.

ARDC's Ballistic Missile Division has been designated a headquarters to rank with a numbered air force. It thus gains new stature within ARDC. . . . Stepped-up news in the helicopter field. AMC Capt. Walter Hodgson set an unofficial chopper altitude record, 30,000 feet, in a Kaman H-43B on December 9. The USSR claimed one of its MI-6 helicopters set a speed record of 166.5 miles an hour over a 100-kilometer closed course. New Bell 47G-3 'copter landed half-ton loads atop Pikes Peak, then took off from there itself. . . . An extreme housing shortage was reported from Vandenberg AFB seriously affecting SAC's 1st Missile Division.

A new study said that Russia now had some 100 missile bases manned by 200,000 men. Renewed ICBM testing was detected within the Soviet Union. . . . Retired Lt. Gen. James H. Doolittle received the 1959 Silver Quill Award "for most distinguished service to business and industry" from National Business Publications on January 21. . . . Jacqueline Cochran was elected president of the National Aeronautic Association on November 17, succeeding Convair vice president and former AFA President Thomas Lanphier, Jr.

SHOOTING THE BREEZE

• Trees at the South Pole? Yes. USAF has planted fifty pine trees at McMurdo Sound, Antarctica, to prevent the dangerous flying phenomenon known as "white out," in which earth and sky blend. Now pilots have trees at the runway approaches to help them stay oriented.

• Here's what Supreme Court Justice Felix Frankfurter thinks of congressional English, one of the court's main concerns in its continuing interpretation of laws:

"The court's task is to construe, not English, but congressional English. Our problem is not what do ordinary English words mean, but what did Congress mean them to mean."

Congress, he said, "habitually uses the English language in an uncommon way, with an unlikely and even odd meaning."

• USAF baseball has struck out, along with that of the Army and Navy. The service has decided to drop worldwide diamond competition because of fiscal limitations. The Marines, traditionalists that they are, announced recently that they will hold an all-Marine "world series" next year.

• In the book world, a recent count finds that USAF has a rich inventory of volumes at libraries around the globe. The over-all total is 4,784,975 books. Service personnel and families visit library facilities at the rate of 39,887 a day.

• The longer you take to make a decision, the greater the chance you'll make a mistake. So says a team of Ohio State University psychologists in a study for ARDC.

• USAF's "Four Horsemen" of Sewart AFB, Tenn., comprise what is probably the world's only four-engine precision formation team. They fly four Lockheed C-130 Hercules transport aircraft.

(Continued on following page)

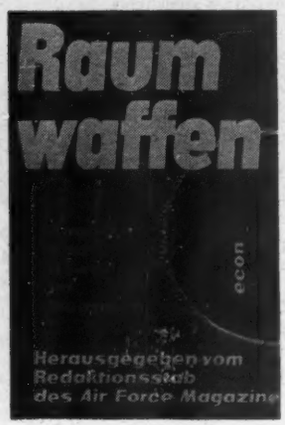
Air Force Secretary Douglas presents Exceptional Civilian Service Award to AFA's Edward P. "Ted" Curtis for his services as general chairman of World Congress of Flight last April. Curtis organized AFA, is a National Director.

VIEWS AND COMMENTS

Notable among the millions of meaningful words uttered and written this month were these. . . .

Sen. Stuart Symington (D.-Mo.), in "Security with Solvency" in the November *Reporter* Magazine:

"By far the greatest waste in government today can be traced to the obsolete organizational structure of the Department of Defense, an organization that cannot possibly function efficiently. Most of our prominent military leaders, including General Eisenhower until he became President, have asserted that unless our defenses are reorganized on the basis of progress rather than tradition, this nation could well go broke."



Have you read *Raum Waffen?* Chances are the answer is yes. *Raum Waffen* is "Space Weapons" in German. AIR FORCE's *Space Weapons Handbook*, hard-cover version of our March '58 issue which was published in US last year, now has appeared in German edition under this title. At left, photo of space handbook cover in the German edition, which is reported by the publishers to be a very popular volume.

The Washington *Post* in an editorial on November 17:

"The country can and will sustain any military budget that is necessary. The strategic facts as this newspaper sees them argue eloquently, not for continuation of the present level of military spending and economic help, but for substantial increases supported by tax adjustments. Such a policy surely is the logical corollary of the view expressed yesterday by Secretary of State Herter in response to the Soviet challenge:

" 'That means subordinating our private interests to the paramount public interest. It also means using our economy less for the things which do not really matter, and more for the things which do.' "

From a statement "Freedom and Peace," by the Roman Catholic bishop's conference in Washington in November:

"Such words as 'democracy,' 'republic,' 'peace,' and 'friendship' are words to which the Western world is long accustomed. These words have been taken into their current vocabulary by the proponents of communism. But while we may use the same words, we are not speaking the same language. By 'peace' the Communist means submission to his program. By 'friendship' he means the acceptance on the part of others of his formula for coexistence."

From "Soviet Policy and World Conquest," by University of Chicago political science professor Hans J. Morgenthau in November's *Current History:*

"The traditional insistence of Soviet foreign policy upon disarmament, preferably total, is a twin brother of its traditional insistence upon peace. It is really unnecessary to emphasize, as it is often done with great seriousness, that the Russians are 'sincere' in their insistence upon both these aims. No doubt they are; for they must welcome, on general grounds and in view of the technological and economic goals they have set themselves, a reduction of the burdens which the armaments race imposes. Yet the Soviet government cannot be unaware of the fact, borne out both by logical analysis and historical experience, that a disarmament policy as a general proposition, divorced from a settlement of the political conflicts which have caused the armaments race in the first place, is an exercise in futility. But it can be useful as a weapon in the propaganda contest; it gives the champion of disarmament . . . the opportunity of posing as the champion of peace."

The *Wall Street Journal* in an editorial on November 30:

"A few years back people were joking about the need for space law, but in the new age of satellites, photos of the moon, and the training of astronauts, people are getting to know it's a serious subject.

"And there's a reason. Russia has planted a flag on the moon and even though Mr. Khrushchev said Moscow does not intend to claim sovereignty, some legal experts are warning that if Russia wins the space race she might very well claim the moon and planets. And, of course, landing on a planet in another solar system might result in a claim to the whole complex, much as LaSalle successfully claimed for France the whole region drained by the Mississippi and its tributaries 277 years ago.

"Meanwhile, scientists are worried about some other matters. Some fear that rockets from earth may carry algae or bacteria to other bodies that will upset their biological state, and that rockets that reach them and return to us may carry germs now unknown to earth.

"Consequently, all nations on earth are concerned and hope to agree on some space laws that will be fair to everybody when it comes to exploration, ownership, colonies, and control of such outer space places as Venus and Mars."

USAF ON FILM

Here is a list of training and documentary films recently released by the Air Force. They are available to USAF units, Reserves, and civilian groups through the Air Force Film Library Center (APCS), 8900 South Broadway, St. Louis 25, Mo.

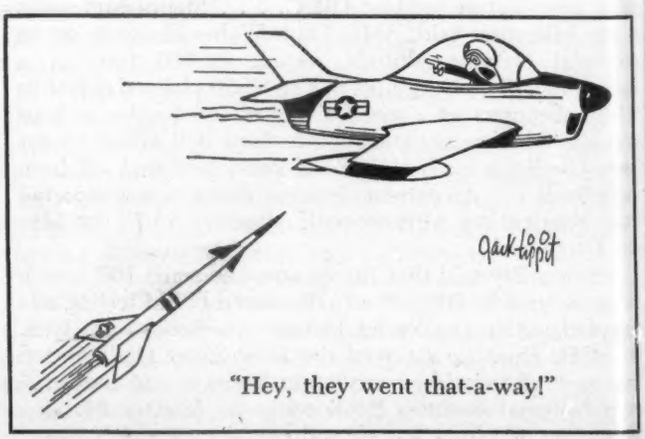
Air Force News Review No. 43

President visits Air Force Academy; Thor training for RAF crews; Clark TV boasts puppets; Weather rocket tested; Orientation Group tells Air Force story; Ski show opens summer season; AFA sponsors World Congress of Flight. Fourteen minutes.

Air Force News Review No. 44

USAF Academy graduates first class; "Flying Brothers" hold conference; MATS gets jet transport; Old timer greets

(Continued on page 27)



"Hey, they went that-a-way!"

Search and Doppler radars for the B-58 Hustler's navigational and bombing systems are produced by Raytheon.

RAYTHEON COMPANY, WALTHAM, MASS.

RAYTHEON

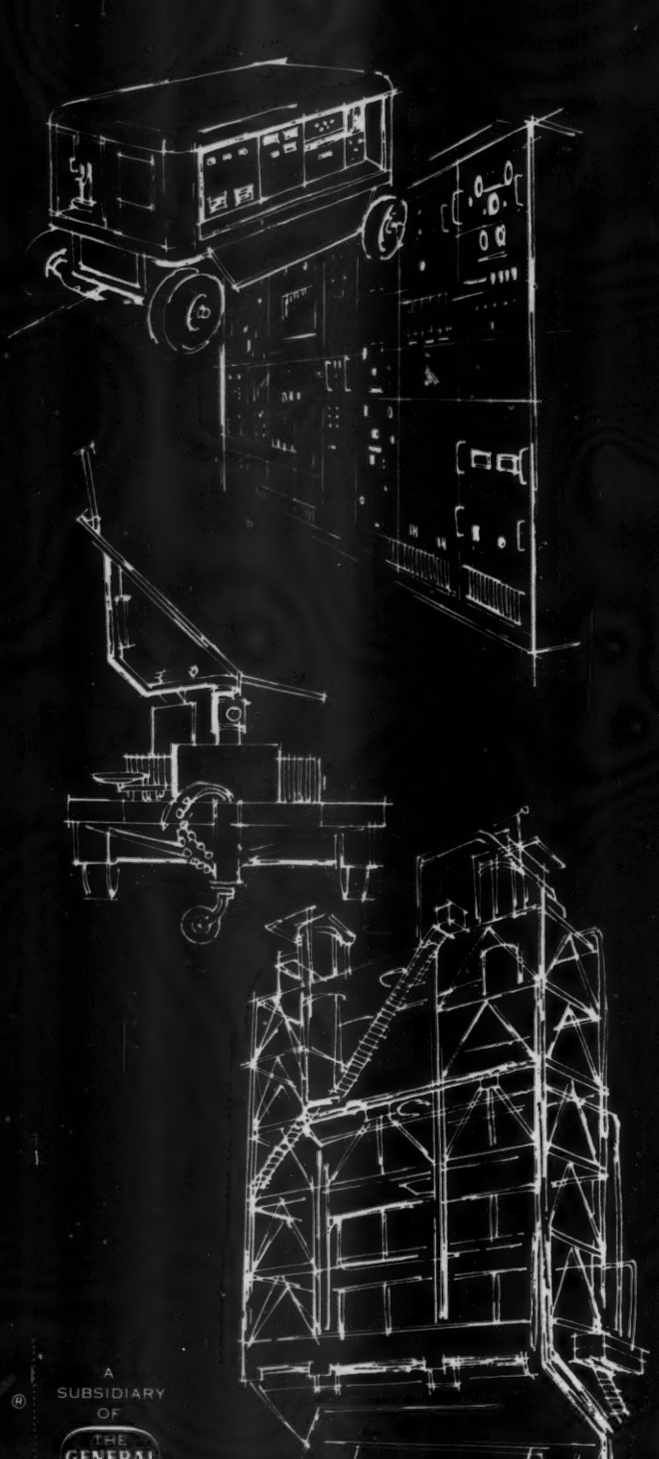
EXCELLENCE IN ELECTRONICS

GSE

by AEROJET

Success in the air depends on support from the ground. Aerojet-General designs and manufactures all types of missile, surveillance drone, and space system ground support equipment.

- General Planning and Logistics
- Test and Launching Facilities
- Ground Handling & Servicing Equipment
- Checkout Systems
- Instrumentation and Control
- Data Systems
- Telemetry
- Communication Systems
- Radar Systems
- Space Position Instrumentation
- Miss-Distance Measuring Sets



Aerojet-General®

CORPORATION

Azusa, California

A SUBSIDIARY OF THE GENERAL TIRE AND RUBBER COMPANY

Plants at Azusa, Downey, San Ramon and near Sacramento, California; Frederick, Maryland

old friend; Joint Exercise thwarts "Aggressor"; Reserves name beauty queen; SAC cuts alert time. Fourteen minutes.

Air Force News Review No. 45

Paris hosts twenty-third air show; Boats back AF tests; Men and machines make maintenance; New techniques aid rescue; Talon begins flight tests; PACAF cops track trophy; X-15 glides. Fourteen minutes.

The Common Defense

Men and events that made military history highlighted in this progress report on the status and achievements of the armed forces in 1958. Features the Explorer I, Vanguard, and Atlas as they are launched into orbit; the altitude records of Majors Johnson and Simon in an F-104 and a balloon respectively; Airman Donald Farrell's week in a simulated space cabin; exploits of the *Nautilus* and *Skate*. Twenty-seven and a half minutes.

I&E Screen Magazine No. 573

Army demonstrates rapid cargo airlift with light aircraft and new loading techniques; RAF missile men receive Thor training at Vandenberg AFB; Navy demonstrates new remote control helicopter; Pictorial review of US forces in Spain and the nation's colorful environment. Seventeen minutes.

Maintainability—Design for Living

To fly higher, faster, and farther is not enough to ensure a combat-ready Air Force. Our manned and unmanned weapon systems must be designed for simple, quick, and economical maintenance. From the first drawing-board configuration to operational flight, design must provide for the system's maintainability as well as performance. Through joint Air Force-contractor efforts, optimum maintainability is achieved. Nineteen minutes. Color.

Air Force Cameras in Action

Outstanding events that made Air Force history in 1958 are relived through the eyes of the camera. Activities shown include nuclear tests, Projects Man-High and Far Side, space studies, the Lebanon crisis, an Air Force good-will tour, and successful launchings of a hybrid Thor-Able missile and the Atlas ICBM. Fourteen and a half minutes.

Project William Tell

Twelve USAF interceptor teams stationed worldwide compete in gunnery and rocketry at Tyndall AFB to prove the effectiveness of "the men and the weapons." Ten minutes. Color.

The Code

Reviews incidents of courage and valor in the lives of American fighting men that illustrate the Code of the US fighting man. Jack Webb is narrator. Twenty-nine minutes.

Operation Zero-Zero (Project Narrow Gauge)

Extensive testing of an integrated visual approach and landing aids system (IVALA) proves that this effective improvement can provide aviation with greater and safer aircraft landing capability. Nineteen minutes.

—FREDERIC M. PHILIPS

APPARATUS DIVISION
TEXAS INSTRUMENTS INCORPORATED
6000 LEMMON AVENUE • DALLAS 9, TEXAS

TI SONAR
in ASW Systems

The Sikorsky HSS-IN all-weather anti-submarine helicopter

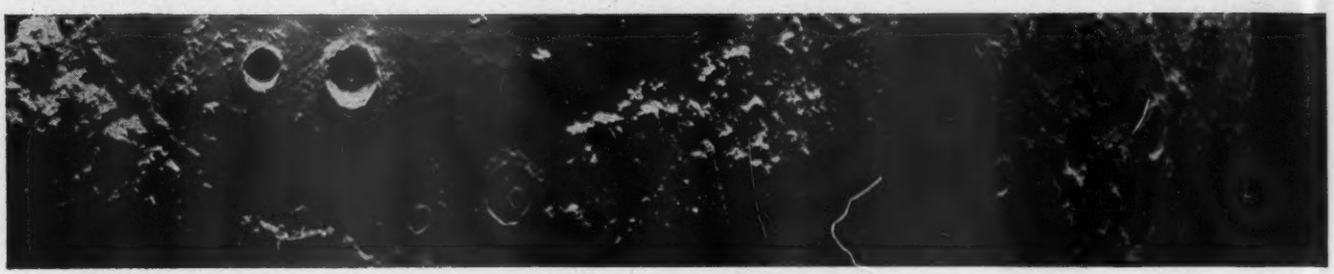
Tinkle the jet spaniel and her master, Eglin AFB test pilot Lt. Col. John J. Kropenick, pose on flight line at Florida base. He has more jet-flight time than any other USAF pilot and his pet spaniel has done most of it with him.

LIBRASCOPE MISSILE COMPUTERS

To the moon and back and wherever missiles fly, Librascope computers deliver ready answers for in-flight control....guidance, optimum trajectories, impact prediction, data reduction and analysis. Throughout flight....Librascope missile computers are uninterrupted by environmental extremes....and they will automatically and continuously check their own built-in accuracy. The compact size, minimum weight and performance of Librascope missile computers have earned them important roles in our conquest of space. For information on how Librascope's advanced computer capabilities can answer your particular needs, write Librascope, Inc., 808 Western Ave., Glendale, California. For information on career opportunities, write Glen Seltzer, Employment Mgr.

LIBRASCOPE A GENERAL PRECISION COMPANY

A Division of General Precision, Inc. ■



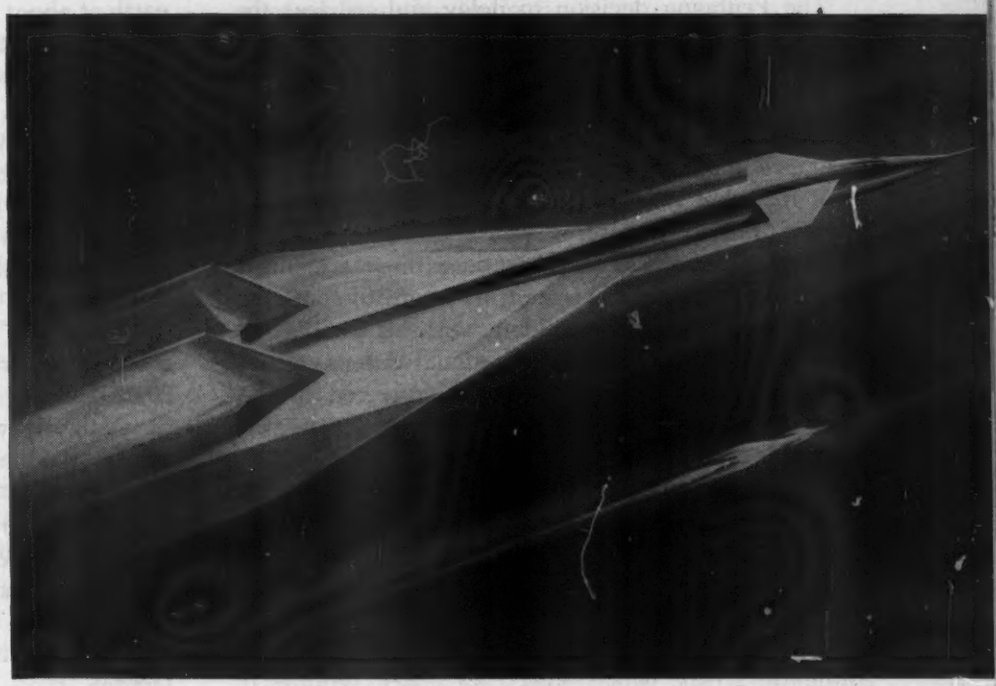
computers that pace man's expanding mind

LI 0-1

Is the cutback of the B-70 the ultimate folly in our policy of "weather-vane planning"?

Are the budget people now dictating military philosophy?

The Gutting of the Valkyrie



"Say, it's only a paper plane, sailing over a cardboard sky."

© 1933 by Harms, Inc., used by permission.

Ed Mack Miller

CONGRESS and the American people now stand as the last hope for continued American supremacy in the skies of the world. Their prompt response and action can yet save a vital weapon system, essential to US survival. Early last month the Department of Defense announced that the B-70 bomber program had been "reoriented."

A better word might have been "gutted."

The Air Force reluctantly and with grave apprehension bowed to what was essentially a political decision in a budget-balancing atmosphere.

From the time the intercontinental ballistic missile entered the military picture, our military strategists have talked and planned in terms of the "weapon mix," a combination of missiles and manned weapon systems which would function together for years to come. This has been considered the best approach to the keeping of the peace through deterrence.

In addition, it has been generally agreed that the complexity and high cost of military weapons required us to take the longest possible look forward in their planning and then schedule concurrency of systems development so that at a given date the pieces could be jigged together to form the finest and most advanced product obtainable. No more of World War II's mating of a new flight platform with whatever bombing, navigation, and armament hardware was on hand at a given time.

But implicit in the deep-cutting B-70 decision was the negation of both the plane-missile "mix" philosophy and the hard-come-by weapon-system concept. As matters now stand, with many B-70 subsystems canceled outright, ECM, bombing, and navigation black boxes for the B-70, if needed, would have to be adapted from the B-52. None of them is truly adequate for a Mach 3 airplane.

The B-70, if the decision stands, will not be a

(Continued on following page)

bomber, only a "bare-bone" airplane. Only two reoriented B-70s are planned; perhaps no others will ever be built. Under current conditions, it will have none of the subsystems to make it work effectively as a bomber. And in a year or so it will be easy to kill the B-70 completely, on the grounds that it is not a useful vehicle without these subsystems!

One fact above all stands out in the wake of the fiscally dictated B-70 decision. The Washington *Post* stated it well in a front-page story on December 3:

"The Pentagon decision to delay and reorient the B-70 bomber is far more than a mere defense stretchout. It means the end of the 2,000-mile-an-hour plane as a bomber, and apparently the end of the line for manned strategic bombers. . . . It is important to recognize the Defense Department's B-70 announcement for what it is—not the postponement of a new bomber, but its demise."

Can the free world afford to be without a manned bomber in its future? Can we truly afford to eliminate the highly trained human being, with his established mastery of the sky, from our national defense equation? These questions were left unanswered in the dollar-haunted atmosphere hanging heavy over Washington.

The North American B-70 Valkyrie strategic bomber is perhaps the most imaginative and sophisticated airplane ever designed.

The B-70's designed dimensions are not far from those of the B-52. It fits into a B-52 hangar. But in other ways the Valkyrie would be a radical departure. Authentic artists' conceptions (*see cover*) endow it with a spaceship quality.

Its long gooseneck, peacock tail, canard control "ears," and tapered body give it the appearance of being, in the words of one observer, "supersonic just sitting still."

Some of the most daring features ever proposed have gone into its design, which is now firm. One primary (and secret) element of its aerodynamic configuration is described as "more important" even than the area-rule ("coke-bottle") design that made the Convair F-102 Delta Dagger supersonic.

Because of this design breakthrough, the B-70 was the first plane scheduled to cruise at top speed for its entire mission instead of cruising to the vicinity of the target subsonically and then going supersonic in a brief dash (at high fuel penalties) like the Convair B-58 Hustler bomber.

Powered by six General Electric J93 engines with a total of more than 150,000 pounds of thrust, the B-70 was designed to cruise at up to 80,000 feet, with a range of more than 6,000 miles without refueling in flight. A crew of four could man the roughly 170-foot-long and 115-foot-wide plane, which would have a maximum takeoff weight of about 250 tons.

The B-70 has been designed to operate with ordinary jet fuel, although for a time it appeared that exotic fuels, such as boron types, would give even better performance. A USAF-Navy program for such "zip" fuel was canceled in August on the verge of completion, then reinstated on a much-diminished scale last month in line with high-energy rocket programming.

Living-room comfort has been designed into the B-70. There would be no need for aircrewmen to wear pressure suits, oxygen masks, parachutes, or the like. The plane, able to fly at some fifteen miles above the earth at about 2,000 miles an hour, with a ten-megaton hydrogen bomb, would provide its four-man crew with optimum cabin conditions in terms of temperature, pressure, and elbow room.

The B-70 would "encapsulate" the individual. In an emergency, the capsule would eject, its chute opening at a preset altitude. The capsule would be equipped with a boat for water landings, and clothing and food suitable for such extremes as arctic or desert survival.

The name "Valkyrie" was selected for the B-70 in a Strategic Air Command naming contest. More than 20,000 names were submitted. In Norse mythology, the Valkyrie were maidens of extreme beauty who ranged the heavens on their steeds, choosing those who were to die in battle and bearing the fallen heroes back to Valhalla.

Originally known as Weapon System 110A, the Valkyrie represented one of the greatest breakthroughs in the history of aircraft development.

The breakthrough was explained by Dr. Hugh L. Dryden, then Director of the now-defunct National Advisory Committee for Aeronautics, before the House Appropriations Committee in February of 1958.

Said Dr. Dryden: "About a year ago, a strange and wonderful thing happened. It was as if the pieces of a jigsaw puzzle began falling into place. Almost simultaneously, research programs that had been under way at the NACA Labs in Virginia, California, and Ohio began to pay off. The result—this is an oversimplification, but it is not an overstatement—was that the companies and the Air Force suddenly realized it would not be much harder to design a long-range bomber that could fly its whole mission supersonic than to design one that would fly subsonic most of the way, and only a small fraction of the flight supersonic. Not only that, but the top speed of the prospective bomber was raised to Mach 3—about 2,000 miles per hour."

Constructed of titanium, stainless steel, and nickel-base alloy, the B-70 has been designed to hit the heart of Russia in less than three hours after takeoff. It could use existing air bases in the SAC system, or even civilian fields like Idlewild in New York, Friendship between Washington, D.C., and Baltimore, or San Francisco International.

The B-70's 250-ton gross weight for takeoff would

be about the same as that of a B-52, its landing speed actually slower than that of the North American F-100 Super Sabre fighter, its range and speed such as to take it around the world (with inflight refueling) in less than half a day. At higher speeds, the B-70's wing tips were designed to turn down fifty degrees to provide better stability.

How fast is Mach 3? This fast. At such a speed, you could eat breakfast in New York at eight o'clock, then take off and arrive in Los Angeles an hour and a half "before" you ate.

In fact, flying west in the B-70 you could make the sun set in the east or bring the moon back up once it had set in the west.

Actually, the B-70 would have so much speed that it would take a tremendous defensive system to cope with it. The plane would move more than thirty miles per minute. At that rate, any errors in quick calculation the enemy might make would compound immediately. A ten-minute warning or computation delay would find the B-70 some 300 miles farther along its route—streaking close to the earth's skin, below effective radar coverage, or so high no ground-based weapon could hit it.

The B-70 at this writing is not a mere dream. Far from it. The plane and its components were in detailed design stage and tooling design when the gutting was announced. A mockup of the plane is in existence at North American's plant at Inglewood, Calif.

But USAF's trisonic "packaged offensive" will probably never be capable of functioning as the superb machine it was designed to be, even when the "bare-bone" plane is flying. Contracts for the following subsystems were effectively cut away, although in some cases the contractors will proceed with the projects involved on their own hook:

- Radar, to have been produced by General Electric with the ability to discriminate between two closely spaced objects at a great distance and possessed of powerful antijamming characteristics.
- A sophisticated new bombing-navigation system by International Business Machines, incorporating modular design and allowing for inflight maintenance.
- A new central air-data system to have been produced by Garrett Corporation's AiResearch Div.
- An extremely advanced electronic countermeasures system to be developed by Westinghouse.
- Motorola's new mission and traffic-control system.
- Beech Aircraft's special power pod.

All major subcontracts for airframe were returned to North American, the plane's prime contractor, in last month's move. Wing production had been in the hands of Boeing Aircraft, stabilizer production assigned to Chance Vought, and upper fuselage development to Lockheed Aircraft.

Under examination, with a possibility of being reduced, are those held by United Aircraft's Hamilton Standard Division (air-induction control and environmental systems); Sperry (gyro platform); Sundstrand Aviation (secondary power system); Cleveland Pneumatic Industries, Inc. (landing gear); and John Oster Manufacturing Co. (powerplant instrumentation).

Fighting a rear-guard action against the budgeteers, the Air Force is investigating alternative uses for the aircraft itself. Even for purposes other than as a bomb platform, the Valkyrie shapes up as a potent piece of flying hardware.

The B-70 could be a:

- Supersonic transport.
- Money-saving recoverable booster for space projects, including the Dyna-Soar test vehicle.
- Space interceptor to query and investigate foreign satellites in orbit.
- Ballistic missile launcher.
- Supersonic nuclear-powered aircraft.

The B-70 could be a first-rate military transport. It could deliver war materials to any point on earth in only a few hours. In a limited war, this would provide an immediate show of strength, with great potential as a diplomatic tool in backing up foreign policy. If the United Nations ever gains a police force, someone suggested the B-70 could be an ideally effective global police cruiser, the "cop on the beat" worldwide.

The Valkyrie was designed to deliver anything—the biggest hydrogen bomb, air-launched ballistic missiles (ALBMs), a "train load" of standard bombs, a series of hydrogen bombs for primary, secondary, and tertiary targets, or a combination of bombs and missiles for sequence attacks. The B-70 could become a tremendous launching platform, taking orbital or space-probe vehicles to the edge of the atmosphere before launching.

From a practical, commercial point of view the B-70 represents almost a quantum jump in the state of the aeronautical art. The world has merely scratched the surface of the potential of air transport. Someone, somewhere, eventually is going to build a Mach 3 transport. And, like most of the technical developments that have brought commercial aviation to where it is today, the money invested in the B-70 would have considerable commercial fallout.

A Mach 3 transport could whisk passengers from coast to coast in little more than an hour, from Honolulu to Denver in less than three hours, and from New York to Paris in the same time.

But perhaps the greatest danger in eliminating the B-70 from our future weapons inventory is the negation of the principle of the mixed force, thereby eliminating versatility and flexibility from our future deterrent strength.

A meaningful SAC motto says, "We must strive for

(Continued on following page)

the greatest technical advance—consistent with continuous capability." In other words, reach, but not so far that you trip.

Intercontinental ballistic missiles and manned intercontinental bombing systems are not competing but complementary. Each has inherent disadvantages which cancel out each other in a mixed force whereas they are compounded in a force wedded to one or the other on an "either-or" basis. Missiles can do things a bomber cannot do and vice versa.

Put together in a mixed force they mean that the prospective enemy cannot rest easy until he has effected a counter to any and all combinations of weapons. Narrow the field of your own choices in delivery systems and you make the enemy's defensive job commensurately easier and immeasurably cheaper.

The manned bomber is selective. It can, in effect, turn its head and peek out of the corners of its eyes. The ICBM cannot. The bomber weapon system can also radar-map the destruction a raid has caused and return with information to plan a subsequent mission. There is little guesswork in the assessment of the damage it does.

One of the big drawbacks of an all-missile force is the question of quick dispatch without recall. For instance, if the DEW Line radar warning net were to pick up blips heading over the pole from Russia, the question would be this: Should we launch our ICBMs? Remember, the blips could be meteor showers, northern lights, migratory birds, or ice-packed clouds. Would we want to start a war by mistake? But they could be attackers. We'd probably wait. . . .

For once the missile goes, it can't be recalled—only destroyed, an expensive undertaking. A few planned "spoofs" by Red strategists actually could cause depletion of our stockpile of missiles.

The bomber force can go even to the point of preparation for bomb drop and still be recalled, with the only expenditure being fuel.

Under national policy, missiles will be launched only with the permission of the President. Bombers can be dispatched without his okay—because they can always be recalled.

With the gutting of the B-70, many knowledgeable persons have stated in recent weeks, we have allowed ourselves to be stampeded by incessant Soviet propaganda which says that all manned weapons are obsolescent. From the size and technical improvement of Red aircraft, it would appear that the Communist world itself is far from giving up on manned airplanes. There is a good chance, in fact, that Russia is today developing her own Mach 3 bomber.

It can easily be seen how we could play into Communist hands by concentrating exclusively on missile hardware. Their defensive strategy and logistics problems would be immeasurably simplified by such a decision on our part.

It has been suggested that one of the neatest tricks the Reds could pull would be to let us put all our nuclear eggs in one missile basket—and then proclaim to the world that they would use only conventional weapons if war came. The propaganda coup would be hard to offset. We would be effectively handcuffed until we could get back into production of nonnuclear weapons—and extremely vulnerable in the interim.

Farfetched? Perhaps, but it illustrates the position we are getting ourselves into by the apparent trend of Administration defense thinking.

If the Soviet hordes broke across the NATO countries, we would face another terrible decision if missiles were our only weapon. Should we fire our nuclear "big birds," possibly even into friendly countries, to combat this Soviet aggression? This would be a fateful step. A versatile manned aircraft striking force with pinpoint bombing capabilities—especially with the capability of switching to nonnuclear warheads—could strike the enemy effectively. Again the advantage of the mixed force.

In this regard, Gen. Thomas D. White, Chief of Staff of the Air Force, recently said, "Manned aircraft will continue to be a military requirement in the foreseeable future. Ballistic missiles and other manned vehicles are not as yet, and may never be, the solution to all military problems."

The B-70, of course, would not be immune to enemy counterattack, but our past experience has shown us that "a weapon developed and produced at the limit of the nation's technological capability will be a competitive weapon in the planned time period." There is no reason to suppose that our B-70 would not be able to more than hold its own against any defense the enemy could throw up against it for quite a few years to come. Even if the enemy's defense "caught up" (at immense cost to him, it might be added), the Valkyrie would remain an immensely potent fighting machine with a great likelihood of outfighting or outthinking an opponent to perform its mission.

By way of analogy, the Nazi fighter planes of World War II were a highly effective countermeasure for our Flying Fortresses, but the US airman and his machine, competing against these defenses, won out.

It would seem, too, that the B-70 could make our investment in ICBMs pay off with dividends. The bomber force could reach enemy territory, in the event of hostilities, shortly after our first barrage of ICBMs. The B-70s would be able to assess the damage and "clean up" targets before the enemy could recover from the first shock of the missile attack.

It is an axiom of military history that the only thing you know for sure about the next war is that it won't be fought the way you plan it now.

Many top strategists believe that it would be utter folly for us to base our force requirements on a sud-

den and conclusive exchange of nuclear missiles. Especially when we have officially created a "missile gap." An insufficient missile force could leave us fearfully unprepared. Versatility may not assume victory, but rigidity will almost certainly assure defeat.

An effective use of the B-70 would be against mobile targets, including truck or train-transported missiles. Another type of target would be that for which we do not have accurate geographical coordinates. In other words, it could do what we suddenly found it had to do without massive advance planning.

An extremely important advantage of the B-70, in addition, is this: Merely the building of the B-70 in sufficient numbers would force the Soviets to enlarge their commitment for home defense. It would cost them more to defend against the B-70 than it would cost us to build the plane. And because the Reds also have budget problems, it would penalize their strategic offensive force, aiding our own security. In fact, the B-70 fiasco may well prove an economic bonanza for the Kremlin, preventing the obsolescence of thousands of their fighters and other elements of their air-defense system. It is Russia, not the United States, that can't afford the B-70.

"To prevail," said the great military philosopher Von Clausewitz, "apply force in the right amount, at the right place, at the right time."

The B-70 can do just that—with maximum efficiency.

For this reason it will behoove the Senators and the Representatives of the United States to reevaluate the B-70 program when Congress reconvenes.

It could be their last chance to rectify a grave error.

As one civilian expert said, "In government today, we are so organized that military decisions made by the best military experience are subject to veto by well meaning businessmen who frequently are on a part-time basis with the government."

In the opinion of the majority of the men who work daily with the defense problems of the country, defensive missiles are not yet ready to assume full responsibility for defense of the nation. Yet the North American F-108 Rapier, a Mach 3 interceptor, was canceled outright in September. A few weeks earlier, Lt. Gen. Joseph D. Atkinson, Commander, Air Defense Command, declared in a speech at AFA's 1959 Convention that a Mach 3 fighter was a "must."

Now comes the B-70 gutting. The Air Force still hopes to revive development of the B-70 as an essential strategic weapon, not a bare test bed with possible eventual uses as a supersonic transport, nuclear-powered aircraft, recoverable booster, or satellite interceptor. Reinstated in the next few months, the B-70 program could still yield operational weapon systems in line with earlier scheduling.

As a bomber, the B-70 is vital to the defense of this country because, to quote one design expert, "It has uninhibited response, it can be tailored to force-application, it is dispersable, it has utility, it has convertability, and it has recallability."

If it dies, one top Air Force officer said bluntly after the DoD announcement, the concept of true national preparedness may die with it.

In sum, what are we, as a nation, on the verge of throwing away if we permit the B-70 program to go down the fiscal drainpipe?

1. We are committing SAC to a subsonic manned retaliatory force for the indeterminate future.

2. We are committing our military planners to a rigid, inflexible force structure which inevitably will make a mockery of our deterrent posture.

3. We are contenting ourselves with second place in the advancement of the state of the aeronautical art. It is quite certain that the Soviet Union will have a supersonic jet transport in service before we do. Now, we are handing them preeminence in the Mach 3 range as well, in the same manner that we are playing second fiddle (or perhaps piccolo) in space. One Air Force planner phrased it bitterly:

"One day," he said, "your kids and mine will be flying in a Mach 3 airplane, but chances are it will have the hammer and sickle on the rudder."

4. We will save $85 million in FY '61—about 1/50 of one percent of our defense spending!

Fortunately there is yet time to correct this tragic blunder. The Congress has yet to meet, and it will have a duty to turn its searching spotlight on the reasoning behind the B-70 decision. Public opinion is still the final arbiter in this democracy of ours, even though it must grope through the obfuscating fog of fiscal scaremongers to reach the facts.

It is an open secret in Washington that the B-70 program has long been the target of the Director of the Bureau of the Budget, Mr. Stans. He claims we cannot afford it. Whether the taxpayer would agree, if he knew the facts, is another story.

We almost lost the B-17 many years ago on the grounds of economy. Atlas, key of our missile force and currently of our space program, fell under the budgeteers' broadax and was kept alive with the contractor's money. Word is that some B-70 contractors are willing to exhibit similar faith in their mission.

It is not too late for decisive action, but the time grows perilously short.—END

As writer and flyer, Ed Mack Miller has followed the aerospace story since the early days of World War II. Readers will recall his word-portraits of Vandenberg AFB and the Air Force Academy on these pages. A resident of Denver, Colo., and a neighbor of the new West Point of the Air, Ed is the father of eight youngsters.

Dr. Conant chats with West Germany's Chancellor, Dr. Konrad Adenauer, during the educator's visit there. Deeply familiar with East-West struggle in Europe, in view of his postwar service as US High Commissioner in Germany, Dr. Conant cites accounts of refugees from East Germany as tragic evidence of what world Sovietization would be like.

Complacency. Lack of comprehension of world situation. Despair over fearsome new military weapons. Confused resignation in the face of national problems. A great scientist-educator-statesman finds these disturbing characteristics of today's American milieu at a time when, more than ever . . .

James B. Conant

AWARENESS Is a WEAPON

WE IN the United States, today, are living in a period radically different from any in our past. Military strategy, new weapons, foreign policy, global economic problems, have become matters which affect deeply each and every one of us. This is a grim period, no doubt about it. Indeed, it is so grim that, for those of us who were of school age before World War I, the facts of life today would have been too terrible to be believed. An idea we took for granted—freedom—we now see challenged by a vast expansive force; two great blocs of nations are standing in opposition, the leaders provided with weapons any one of which could destroy a single city. Our existence and our freedom are both in danger. This seems to me an obvious, if highly unpleasant, fact.

Yet, as I have traveled around the country during the last two years, with few exceptions I have sensed no awareness of the nature of our peril. For the most part, I have encountered little but complacency. As only one example, I can cite some of my experiences in arguing about educational matters. I have met all too often a resistance to starting any discussion from the premise that we, as a nation, are in danger. There is in certain circles an unwillingness to agree that there is an urgency today which is a consequence of our struggle with the Soviet Union, a reluctance to talk in terms of the national need.

But let me make it plain that the educators I have in mind are by no means exceptional in their reactions. How many of us as citizens, as voters, and as taxpayers are ready to face the consequences of the international situation? To what degree does one find the sense of a national emergency as one talks with various types of persons? Are the discussions of the complex matter of taxation carried on in the same spirit that would prevail in time of war? The answer is clearly "no." Yet the necessity for spending

money for defense (using this term in its broadest sense) is obviously as pressing as though we were engaged in an actual armed conflict.

The high degree of complacency of which I speak is compounded, in a curious way, with despair—despair at understanding the altered military situation, and hence a feeling of almost hopeless resignation and an unwillingness to discuss the choices which lie before the American people. To my mind there are two basic difficulties in analyzing the present situation. These difficulties tend to block a realistic, calm discussion of the foreign policy of the United States, and these blocks in turn lead to the attitudes of indifference to which I have just referred.

One difficulty involves the nature of the struggle; the other is a consequence of the terrifying nature of new weapons. As to the first, it is hard for Americans to envisage what would be involved if we surrendered to Soviet imperialism—surrendered at once or step by step. The basic issue of freedom is too easily obscured. This is particularly true today. Russia is now relatively accessible to travelers and reporters. The picture we receive of the Soviet Union is that of a country in which many well educated people appear to be quite satisfied with their lot—particularly scientists and engineers. (The Communist Party has been clever enough to provide a large degree of initiative and freedom for this group.) . . .

The process of "Sovietization" in Russia was completed some years ago; the dissenting elements have been long since completely crushed. The significant scene for us, therefore, is *not* the Soviet Union but a land which is in process of being transformed to fit the Soviet pattern. Such a land is the Soviet Zone in Germany, and we can obtain a glimpse of what Sovietization is really like by looking through the Iron Curtain at a place where the Curtain is transparent—namely, the city of Berlin.

I wish all citizens of the United States could spend a few days in that city as I did, once again, last [October]. I wish they could hear the tales of the refugees who, escaping from the tyranny of the Communist rule, continue to come to Free Berlin at the rate of four or five hundred a day. I wish everyone could hear, as I did recently, what a refugee has to tell about life in a society in process of being Sovietized. (Each refugee, you know, is examined by a small committee in the refugee center before being certified as a bona fide refugee and being flown out to the Federal Republic of Germany to safety and to a job.) Secret police, arbitrary arrests, long sentences, demands to spy on friends and relatives, pressures of all sorts, such is the pattern imposed on the unfortunate inhabitants of the Soviet Zone of Germany—the so-called German Democratic Republic.

The American public should be far better informed than it is about the realities of life on the other side of the Iron Curtain in Germany. If people knew the facts of what has been going on for years in the Soviet Zone of Germany, they would be in a better position to judge the nature of the struggle with Soviet imperialism. Furthermore, they would then be under no illusions about the aims of Soviet policy in Europe, for the Communist leaders in Eastern Germany have repeatedly stated quite frankly that they intend not only to neutralize Berlin but eventually to take over all of Germany itself. . . .

Oskar Morgenstern in his recent book *The Question of National Defense* has written: "Widespread death and destruction are a certainty if a large-scale war is our fate. But it would take a man with great power of illusion to see surrender in a better light than death." *[See* AIR FORCE/SPACE DIGEST, *December '59, page 6.]*

This statement . . . leads me to a discussion of the second difficulty which blocks a calm discussion of our foreign policy. I refer to the horrifying nature of the new

Gate to freedom, the famed Brandenburg Gate, which separates East from West Berlin, as viewed from East Berlin.

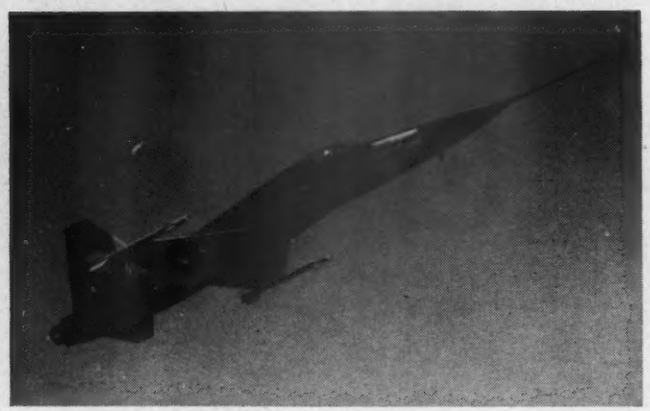
weapons. To mention thermonuclear bombs and rockets is to freeze the conversation in many gatherings. "The prospects are too terrible to contemplate" is the usual response to anyone who attempts to start a discussion of military strategy. Yet, as a free people, we surely must face up to what is involved in the technological military developments of our time. And as Professor Morgenstern makes plain, the choice should *not* be between surrender and large-scale war. It is our job so to arrange matters in this country and in the free world that this will not be the choice before us.

Let us see what are the outlines of the steps which are required. First and foremost must come the assurance of our physical survival. And to make the illustration relatively simple, let me anticipate the course of technological development and assume that we are living in a period when thermonuclear weapons will be delivered by rockets, either intercontinental or of more limited range—a period when the airplane is no longer the vehicle for carrying the thermonuclear bombs. Having no access to classified information, I make no prophecy as to when this period will be reached, but it seems safe to say that at least by 1970 we will be living in this kind of fearful world. Under such conditions, there is one essential for our survival as a free nation, and that is that we possess an invulnerable system of retaliatory power and that the Soviets believe the system to be invulnerable.

What do I mean by these words "invulnerable system" of retaliatory power? I mean that we must possess a system of rockets which will survive any thermonuclear attack by an aggressor, even assuming that the aggressor can concentrate all his forces against our own delivery system for thermonuclear weapons. What do I mean by "retaliatory power"? I mean that such a system surviving a thermonuclear barrage would be able in retaliation to deliver thermonuclear weapons to such an extent and in such a way that at least three-fourths of the industrial complexes of the Soviet Union would be utterly destroyed.

The system will be invulnerable because of the dispersion and the mobility of the many individual components. As an example of mobility one may mention the

(Continued on following page)



Multipurpose Northrop N-156F Freedom Fighter, carrying a pair of deadly Sidewinder missiles. Newly developed craft is being built to bolster Free Europe's strength.

type of missile and missile system which is to be embodied in the Polaris submarine, which has been announced as operational in 1960 with ability to discharge sixteen thermonuclear bombs. Similar mobility is feasible as part of the dispersion of the retaliatory system on the continent of Europe, which presupposes, of course, the continuation of NATO as a vital organization.

The development of such an invulnerable system for the near future is clearly a number-one priority in terms of national budget and the national effort. There will be a short period of transition in which our present retaliatory system, which I assume to be invulnerable, must be appropriately altered to meet the time when the airplane no longer functions. I have no doubt it will be, provided the people of the United States understand the realities of the situation. A thermonuclear stalemate even in the age of rockets is, therefore, the prospect which we must keep in mind. Unfortunately, the creation of a truly invulnerable retaliatory system by no means completes the military picture. There is another item of equal priority on the list. We must continue for the foreseeable future a strong, modern, flexible military force which could respond to local aggression anywhere on the far-flung frontiers of freedom. And this military force should be thought of in terms of the total effort of the free peoples of the world to protect their freedom.

This is so obvious that one would hardly think that the need for keeping NATO strong, for example, would require argument today. One would have thought that the experience of World War II, jet planes, and now intercontinental rockets would have destroyed the last residue of isolationist sentiment in the United States, but I am sorry to say that is far from being so. There still remains in some quarters the illusion that we can withdraw from Europe and leave the Europeans to handle their own problems—military, economic, and political.

Opponents of foreign aid—and those who are worried about either the budget or the flow of gold—come up from time to time with the idea that we should withdraw our troops from the continent of Europe. There surely must be other methods of handling the serious problems of budget and fiscal policy without considering an action which would soon destroy the NATO alliance, built up with so much effort. Even a slight diminution in the American forces would have the gravest consequences, as Europeans would interpret such a move as the first step in a complete withdrawal. . . .

It will take the wisdom of our best statesmen, economists, and industrialists to keep the free world prosperous and politically united. It will take the best brains of our military in the free countries working together and with the cooperation of scientists, engineers, and civilian strategists to provide both the invulnerable retaliatory system to which I earlier referred and the powerful flexible forces to handle threats of limited military aggression in different areas of the world.

To quote from the Draper Report [the report made by the President's Committee to Study the United States Military Assistance Program, known as the Draper Committee and headed by William H. Draper, Jr., Chairman]:

"The free world is gravely threatened by the aggressive onslaught of a powerful and determined opponent—the Sino-Soviet Communist Bloc. There is no precedent in history for the enormity of the threat." If this be true, as I believe it surely is, then there should be a corresponding response on the part of the American people—a response so vigorous and unflinching as to be without precedent in times of peace.

Fundamentally, the real issue will be decided, to my mind, by the attitude of the people of the free nations and particularly by the citizens of the United States, for we must play the leading role because we are the largest and most powerful country that stands in opposition to the Communist doctrine. Complacency and indifference will certainly not suffice. In World War I, in World War II, and in the time of the Korean War (though to a less degree) we were ready to make the sacrifices required to maintain our independence as a nation and the basic framework of a system of free men. It is difficult in this time of struggle, but not of war, to create the climate of opinion which should be comparable in its effect. It is difficult but not impossible.

To be sure, there exists, today, a dangerous gap between public opinion and reality. But I am confident that the gap can and will be closed. Indeed, to believe otherwise would be to become a defeatist as to the ability of a representative form of government to survive. As I have already pointed out, it is the complexities of the problems and the rapid changes since the end of World War II which have confused so many citizens.

As to weaponry, we may well be nearing the end of the period of rapid change. The age of rockets and thermonuclear bombs is near at hand, and, as we approach this dread time away from which we instinctively turn our eyes, we are getting bolder. There are signs that we are preparing to face up to the problems. Articles and books have already appeared which help clarify people's thinking, once the readers are ready and willing to discuss calmly terrifying possibilities.

Clearly what we are concerned with is a series of educational problems. . . . I stated at the outset I was not going to talk about education. Yet, perhaps in a sense I have been speaking about this very subject. In this country, education and freedom are inseparable.—END

The author, James Bryant Conant, delivered the address from which the above article is excerpted in accepting the Woodrow Wilson Award for distinguished service to the nation. The award was presented in New York on November 12. During the war Dr. Conant, then president of Harvard University and a former chemistry professor there, was a prime figure in the scientists' mobilization that resulted in numerous technological developments including the atomic bomb. He served as US High Commissioner for Germany from 1953 to 1955 and as Ambassador to the newly created West German Republic from 1955 to 1957.

THE NEW AGE OF COMMUNICATION

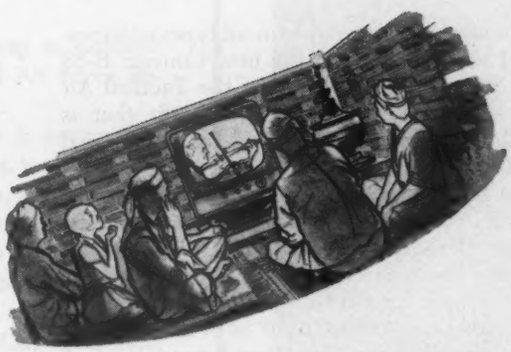
WORLD-ROUND TV!

By the time today's sixth graders leave college, space relay television will start to change the world. It began in December, 1958, when President Eisenhower's Christmas message was transmitted from space. This was Project Score. In a little over a year a more advanced system will orbit communications satellites that will provide 1,000 times the communications potential of their predecessor.

This is the beginning. In ten years the new age of communication will be changing the world. TV sets will offer dozens of channels. Ideas, entertainment, news, education can reach every home or hut on earth. The language barrier to world-wide communication will vanish, for programs will be broadcast in many languages; the viewer will select his native tongue as simply as he switches channels today. Jamming or censorship will be difficult or impractical.

Radiation Incorporated played an important part in Score and will participate in its more sophisticated successor. We developed the antenna that received the first voice from a space satellite. Now we're developing, and will install, the tracking communications stations for the new project.

RADIATION IS a growing company in space communications. Our business is research, development and manufacture of electronic systems, including radar, telemetry, data processing, test devices and related electronic equipment. If you'd like more information on Radiation, write for the latest capability report. Address: Radiation Incorporated, Dept. A1, Melbourne, Fla. Radiation's plants are at Melbourne and Orlando, Fla.; Mountain View and Palo Alto, Calif.



RADIATION
INCORPORATED

MAIN OFFICES AND PLANTS ARE LOCATED AT MELBOURNE AND ORLANDO, FLORIDA; MOUNTAIN VIEW AND PALO ALTO, CALIFORNIA.

Fort Walton Beach, Florida

The Town That's Learned to Live with the . . . SONIC BOOM

FORT Walton Beach, Fla., is the "Home of the Sonic Boom" and proud of it.

A Gulf Coast city of 12,000 population, with some small business and a fast-growing reputation as a winter playground, Fort Walton Beach also is the next-door neighbor of Eglin Air Force Base. Eglin is the home of USAF's Air Proving Ground Center and itself has a population of 12,000, equal to that of Fort Walton Beach.

Part of the Air Research and Development Command, APGC uses Eglin's 465,000 acres to test new and supersonic weapon systems. The missions cover all kinds of operational evaluations, runs over bombing and gunnery and rocket ranges, and tests of all the subsystems that must be proven out for the using commands. The sonic boom is routine and has been ever since work was started on Century series fighters.

Today Eglin's ramps are crowded with all types of supersonic fighters and interceptors and the new Convair B-58 Mach 2 bomber. The field is the home of the Tactical Air Command's 335th Fighter Squadron, elite outfit that is testing the Republic F-105 and preparing for operational status at the same time.

To Fort Walton Beach, this activity means that the sonic boom is a noise we live with every day. Milford Reynolds, congenial manager of radio station WFTW, says that he never hears the sonic boom any more.

"I know we have them several times a day in Fort Walton Beach," Reynolds said, looking as if he were trying to remember the last time he heard one, "but I guess I'm just used to it. Once I lived near a railroad track and got so that I couldn't hear the trains. It's just the same with the sonic boom when you live in this area."

When WFTW has a station break the call letters are announced like this: "This is station WFTW, Fort Walton Beach, Fla., Home of the Sonic Boom."

Mayor Hilary T. Stewart, who also is vice president of the Bank of Fort Walton, and City Manager Winston Walker have both picked up the slogan for their official stationery. So has the Fort Walton Beach Chamber of Commerce, where every letterhead has "Home of the Sonic Boom" emblazoned across the paper. Gary Lee, local dealer for Ford and Pontiac automobiles, is preparing bumper stickers with Fort Walton Beach's new claim to fame printed on them for the cars of local residents and northern tourists alike.

City Manager Walker, who is one of the busiest men in town, says Fort Walton Beach has grown proud of the fact that it could be first to claim the sonic boom as its own. He hopes it will become what the cod is to Boston and Brotherly Love to Philadelphia. "Our town," Walker says, "is proud of its fine relationship with the Air Force, and adopting the sonic boom has been popular right down the line."

Mayor Stewart is equally enthusiastic about this noise he has learned to live with. "There is no way we can stop it," is the way the Mayor looks at the supersonic thunderclap, "and if it is necessary to the Air Force we can live with it and learn to like it." Gary Lee, the auto dealer, can't understand why anybody ever objected to the sonic boom in the first place. To him, it means USAF is on the job and doing it well.

Wayne Bell, editor of the *Playground News*, the local weekly, has been giving editorial support to the campaign. His paper has printed all the news—particularly the news that the City Council adopted a resolution proclaiming Fort Walton Beach as the Home of the Sonic Boom and presented a framed copy to Maj. Gen. Joe W. Kelly, APGC Commander. The resolution is printed on the opposite page, along with photos of the community leaders who have taken part in the local effort.

Much of the initial credit for the Fort Walton Beach accomplishment goes to Col. John N. Reynolds, Eglin Base Commander, who is the man most concerned with local community relations. One of the first groups approached by Colonel Reynolds was the Fort Walton Beach Coffee Club, a once-a-week *klatsche* of businessmen that holds a one-hour meeting in a local hotel. The Fort Walton Beach Coffee Club now is known as the Sonic Boom Coffee Club. After all, Fort Walton Beach lives with the sonic boom.

—CLAUDE WITZE

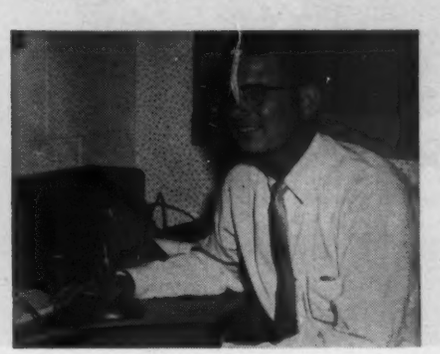
In his office at the local bank, Mayor Stewart lays claim to the sonic boom for Fort Walton Beach. Listening is Claude Witze of AIR FORCE/SPACE DIGEST.

Gary Lee, local booster, rides around town in ancient auto, sells new ones.

Editor Wayne Bell gets lots of news out of his neighbors who fly so fast.

At City Hall, Mayor prepares to sign resolution (below) passed by council.

City Manager Winston Walker adds his endorsement to the Air Force program.



Milford Reynolds shares the air with USAF, can find no interference there.

RESOLUTION 59-37

A Resolution Formally Proclaiming the City of Fort Walton Beach, Florida, as the Home of the Sonic Boom, and Providing for an Effective Date

WHEREAS, the City of Fort Walton Beach is the chosen home of a large portion of the military personnel stationed at nearby Eglin Air Force Base, and

Whereas, Eglin Air Force Base is rapidly advancing to national and international renown as a leader in the field of Air Force Research and Development, and

Whereas, this Air Force Research and Development is exemplified by a sonic boom—"a sound of security"—now, therefore, be it resolved by the City Council of the City of Fort Walton Beach, Florida,

Section 1: That, being zealous to recognize and advance the harmony presently existing in all instances between the Eglin Air Force Base and the City of Fort Walton Beach, and being in accord with the intent of base officials to promote this area nationally and internationally as the Home of the Sonic Boom, the City Council of the City of Fort Walton Beach does heartily endorse this movement and does hereby proclaim the City of Fort Walton Beach as the

Home of the Sonic Boom

Section 2: That in order that this action may coincide with the press releases issued from Eglin Air Force Base,

This resolution shall take effect immediately upon its passage and approval by the mayor.

Attest: O. K. Rodgers
City Clerk

Adopted: October 2th, 1959
Approved: Hilary T. Stewart, Mayor

USAF's Maj. Gen. Joe W. Kelly shows off resolution proclaiming the community as "Home of the Sonic Boom."

Ultra-modern medical equipment is used in major surgery at the Air Force's new Aerospace Medical Center at Brooks AFB, Tex. "Heart-lung" machine, employed in this heart operation at the Center, sustains the patient during the surgery, performing work of the two organs, while doctors work on patient's exposed heart.

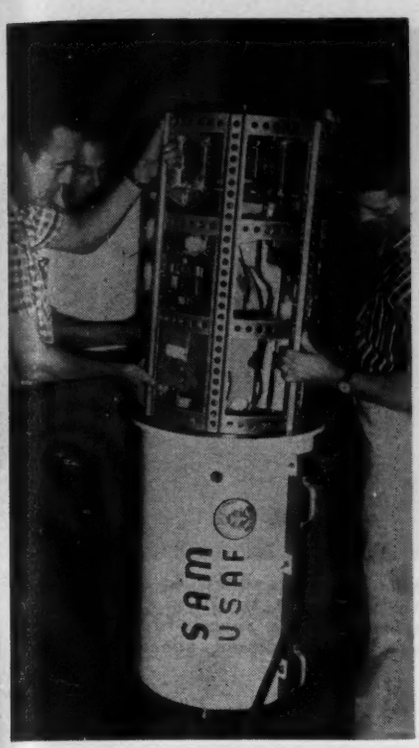
An Air Force infant receives the expert care of an Air Force nurse at one of USAF's many medical installations. Dependent care is a significant part of the Air Force Medical Service's important mission around the globe.

AIR FORCE MEDICINE

Maj. Gen. Oliver K. Niess, USAF

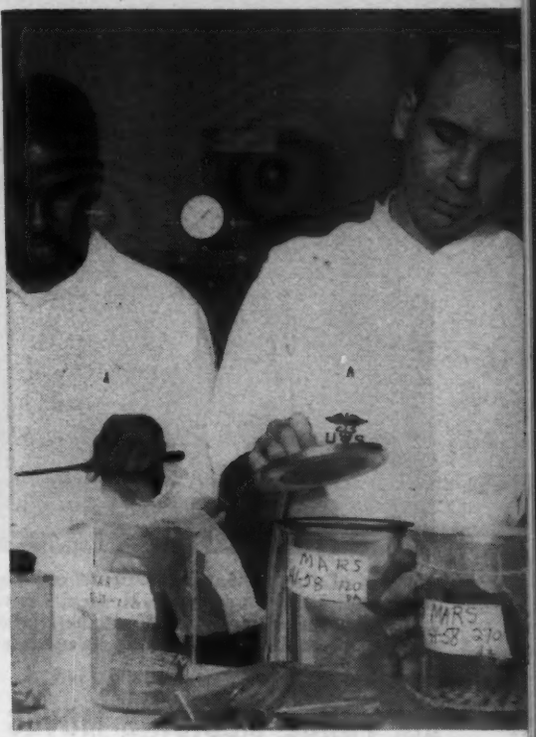
SURGEON GENERAL

The three USAF-NASA Astronauts, symbolic of USAF space medical research; Captains Donald Slayton, Leroy Cooper, Jr., and Virgil Grisson. Trio are members of the seven-man group of spacemen in training for US Project Mercury program to orbit a manned capsule in the early 1960s.



USAF-developed "biopack" above was used in recent safe recovery from 55-mile-high NASA shot of rhesus monkey, Sam, named for School of Aviation Medicine, where the now-famous simian received his special training.

The "living quarters" inside the biopack. Here a "cousin" of Sam is exhibited by University of Texas' Dr. Lynn Brown. University maintains a monkey colony for the Air Force's program of aerospace medical research.



"Mars Jars." Air Force technologists grow simple organisms in these containers, which hold gaseous and temperature environments experts believe exist on neighbor planet, to help determine if life exists on Mars.

From obstetrics to operational missile pads, adequate medical support is a must. With a view toward meeting the foreseeable and unforeseeable, the USAF Medical Service continues its global mission and looks too, toward preparing man for flight into space . . .

MOVES INTO THE SPACE AGE

IN THE short time span that it will take you to read this article—perhaps ten minutes—one Air Force baby will be born and 225 outpatient visits will be made to Air Force hospitals or dispensaries throughout the world.

Annual totals are some 55,000 babies delivered, 404,000 admissions, and 12,000,000 outpatient treatments. During the course of an Air Force medical day, many thousands of service students will attend medical courses to qualify as flight surgeons or to cross-train in additional specialties and in laboratories. Hundreds of research projects will be under way to broaden our knowledge of man and his environment.

In supporting the Air Force mission worldwide, the Air Force Medical Service operates the USAF Aerospace Medical Center including a School of Aviation Medicine, four research laboratories, 134 hospitals, and 106 dispensaries staffed by 8,310 medical and dental officers and 31,744 other medical personnel. These data, I believe, give some indication as to the scope of our activities.

While the Air Force Medical Service, as a separate service, only recently celebrated its tenth anniversary, its roots go much deeper. Early in World War I it became apparent that physical defects of the pilot rather than structural deficiencies of the aircraft were contributing factors to the majority of fatalities which occurred. To provide for research in aviation medicine and establish improved physical standards for pilots, the Army Signal Corps established the Air Service Research Laboratory at Mineola, Long Island, N. Y., in January 1918. This research facility evolved into the present-day Air Force School of Aviation Medicine, a component of the newly organized USAF Aerospace Medical Center. SAM has been internationally recognized for both its research and academic programs, notably the establishment, in 1949, long before Sputnik, of its Space Medicine Division.

In the half century since man first flew, we have witnessed tremendous progress in the state of the art of aerial flight. Pacing this swift progress have been giant strides in medical research and development which have enabled man to meet and overcome the physical, mental, and environmental demands of high-performance, high-altitude flight.

(Continued on following page)

A view of the Research Institute complex of the recently dedicated USAF Aerospace Medical Center at Brooks. This building houses the Space Medicine Division's one- and two-man space cabin simulators, and a medical-radiation facility.

Sen. Lyndon B. Johnson, Democrat of Texas, was the feature speaker at the dedication of the new Center. The Senate Majority Leader called in his speech for added emphasis and greater effort in American space activities.

AIR FORCE MEDICINE MOVES INTO THE SPACE AGE

The progress of the pilot has been paralleled, and in some cases preceded, by the flight surgeon whose continuing task has been to predict the unknowns of human reactions to an essentially hostile environment.

It is this responsibility for the welfare of our flying personnel in environments peculiar to Air Force missions that distinguishes Air Force medicine from that of the other services. Organizationally, Air Force medicine is established as a part of the staff, rather than as a separate corps or bureau. The medical officer is responsible to the commander for the health of his organization. I believe this close identification with mission accomplishment underlies the fine spirit of cooperation and sense of mission support which is found in the Air Force Medical Service today.

In developing and operating a medical service to support the Air Force in its operational missions, three programs have been emphasized: clinical medicine, research, and teaching.

The basic aim of the Air Force Medical Service is to maintain combat effectiveness through providing medical care to the individual at base level. While it was a part of the Army, the Army Air Corps provided general medical care at base level but depended upon the Army for specialty care. With the establishment of the USAF Medical Service in 1949, it was assumed that this arrangement would continue, and no arrangements were made for Air Force general hospitals. With the sudden expansion of force strength during the Korean conflict, the Army and Navy were hard pressed to meet their own medical requirements and the Air Force was compelled to enlarge its hospitalization capabilities.

Since its origin ten years ago, the Air Force Medical Service has constructed more than 200 new medical and dental facilities. Today, there are eleven Air Force specialty hospitals in the continental United States and one in each major overseas command offering care in thirty-one medical specialties.

To provide the best possible medical care to the Air Force's some 508,000 married personnel and their 870,000 dependent children, we have pioneered the Air Force Clinic. These operate much like civilian clinics.

The Air Force Clinic at Andrews AFB, Washington, D. C., for example, is an integral part of the hospital with a staff of specialists, each serving both inpatients and outpatients. Each clinic is flexible in organization and has no fixed number of beds for hospital care. Rather it is equipped and staffed to meet the needs of the particular base mission. The clinic has been one of the major developments in Air Force medicine during the past ten years.

In the interest of not duplicating facilities or service we have worked closely with the other services in sharing capabilities. For example, we have used the fine facilities of the Army's Burn Center in Texas with good results. Last year the Air Force spent $18,778,000 to obtain inpatient care from the other services. Nor has this been a one-way exchange. We provided $8,388,000 in inpatient care to the Army and Navy.

Aeromedical evacuation is also an important area of responsibility. The concept of aerial evacuation of casualties, which was developed during World War II, was proved during the Korean conflict. During the past decade, the Military Air Transport Service has moved approximately a half-million patients in its global aeromedical evacuation system.

Medical research programs are carried out at four locations: the School of Aviation Medicine, at Brooks AFB, Tex., concerned with basic research in aerospace medicine; the Aero Medical Laboratory at Wright-Patterson AFB, Ohio, which conducts applied human factors research and develops end items of personal equipment and where America's seven Astronauts underwent their stress tests; the Air Force Missile and Development Center at Holloman AFB, N. M., which contributes to the human factors program in the fields of space biology and biodynamics; and the Arctic Aeromedical Laboratory, Ladd AFB, Alaska, which investigates problems of living conditions and combat efficiency of military personnel in the Arctic.

While our research programs are oriented to provide the means for man's survival and function in air and space, aerospace medical research has made important contributions to general medical practice.

The impact on general medicine has been twofold. First, it is increasing our knowledge of our natural physical environment on earth, and it is influencing the development of

The development of precision medical instrumentation is highly significant in research. Here a Wright Air Development Center specialist works on preparation of electrodes for careful measurements in diagnostics.

Dr. Allen Katzberg, chief of cellular biology section at the Aerospace Medical Center, operates special movie camera that takes motion pictures of growing cells, speeds time so that whole day's growth can be studied in minutes.

CONTINUED

medical instrumentation, and methods used in diagnosis, observation, and therapy.

An example is the environmental factor of gravity. Gravity has been and remains one of the vital topics in aeromedical and space medicine research. When man first flew, increased Gs were observed as resulting from aircraft maneuvers. Now, in the coming spaceflights, we are faced with still higher and longer lasting G values during launching and reentry into the atmosphere. Physiological studies on centrifuges and rocket-powered sleds have provided the knowledge of how to cope with these dynamic conditions in flight. They are also of great value for the analysis of mechanical injuries and protection in traffic accidents here on the earth's surface.

Studies of the psychophysiology of sensory deprivation, isolation, and confinement conducted in conjunction with studies of space-cabin environments should lead to man being better able to face the stresses and strains of his everyday environment. Also such studies as the biological effect of cosmic rays upon tissue have already increased our knowledge about the impact of these ionizing radiations and have been of great interest to every physician.

Also, space medicine has developed and tested new methods of instrumentation in space-cabin simulators and actual rocket flight for recording environmental factors such as oxygen and carbon dioxide pressures, and new methods have been developed to keep them in physiologically acceptable ranges. The application of these new methods and highly miniaturized instruments to hospital patient care could be profound. It is not inconceivable to me that patients could be electronically monitored, so to speak, and be watched from a central recording table many miles away.

The School of Aviation Medicine, formerly at Randolph AFB, Tex., and now at Brooks, in addition to its research mission, has played a vital role in our training program. Now, with the establishment of the Aerospace Medical Center at Brooks, and by combining the School of Aviation Medicine at Brooks and its Gunter Air Force Base Branch, and the USAF Teaching Hospital and Epidemiological Laboratory at Lackland Air Force Base, our training programs as well as our research activities are greatly enhanced.

Our Air Force residency training program in aviation medicine set standards which in 1953 led to the recognition of aviation medicine as a specialty. Today, more than 100 Air Force flight surgeons are certified in Aviation Medicine. A measure of the stature attained by the school is the universal interest and an acceptance of the teachings and philosophies of the School of Aviation Medicine by scientists, educators, politicians, and government leaders.

One important aspect of our training mission is the sharing of knowledge and information with our medical counterparts in friendly nations. We have supplied equipment and high-performance aircraft to allied nations through mutual defense programs, but unless their flight surgeons are able to medically support their pilots and indoctrinate them in the physiology of flight, they will not be able to function effectively as guardians of the free world. More than 300 medical officers from allied nations have been trained at the School of Aviation Medicine.

What of medicine in the missile and space age? The nature and scope of medical support to meet Air Force requirements in the next ten years is emerging. In the period ahead, the Air Force will supplement manned aircraft with ballistic missile systems to provide the nation's war deterrent and retaliatory capability. Thus, the Air Force Medical Service is faced with providing complete medical support for an entirely new complex of weapons while meeting the growing complexities of physiological problems of our pilots and crews of extremely high-performance aircraft.

Medical problems peculiar to ballistic missile operations and the changes in medical support requirements they are generating become clear if we consider the nature of an operational missile unit. A Thor squadron has strategic mobility for deployment to overseas areas and operates at a varying number of launch positions located some distance from a support base. Squadron strengths, exclusive of support personnel, may vary from 400 to 600 in number.

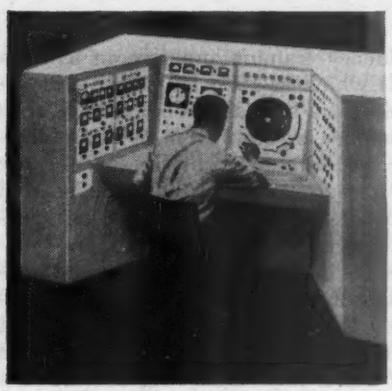
Missile operations are highly complex and permit no margin for errors. Some twenty separate specialty training courses for the Thor system attest to the variety of technical skill required. Unit for unit, missiles require nearly one-third more personnel in the electronics-technician cate-

(Continued on page 45)

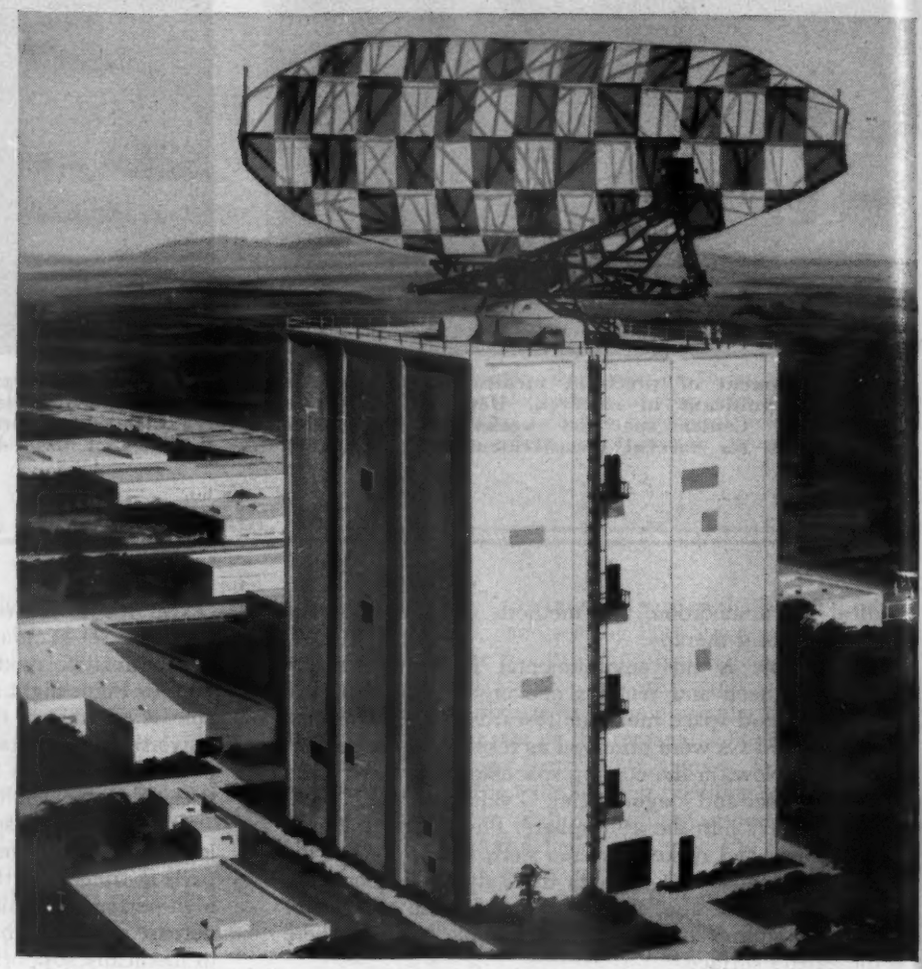
In 1936—air defense by **SPERRY**

Before the invention of radar, Sound Locators aided the human ear in sensing the approach of aircraft.

HIGH SPEED COMPUTERS housed in tower calculate target information from radar and provide intercept-destroy data.



CENTER OF OPERATIONS for FPS-35 installation is MAJAC—Monitor, Anti-Jam and Control Console.



TOWER OF STRENGTH in U. S. defenses, area search radars by Sperry will be spotted strategically throughout main Air Force defense networks.

Giant Sperry Search Radar To Strengthen U. S. Air Defenses

First fortress-like radar is "on the air" only 19 months after contract

New, high-powered area defense search radars housed in giant concrete "fortress" towers—are taking their place in America's vast chain of air defense systems. The first such tower was constructed at Thomasville Aircraft Control and Warning Station in Alabama.

These radars (AN-FPS-35), developed by Sperry's Surface Armament Division in close cooperation with USAF's Rome Air Development Center, will become part of the Continental Aircraft Control and Warning System which searches out cruise-type missiles and aircraft.

The giant antenna assembly, weighing nearly 70 tons, is situated on a concrete tower 85 feet high and 60 feet square. The radar feeds target position information into high speed computers, which in turn work out involved calculations for interception and destruction of the target by missile weapon systems. The tower houses the full complement of men and equipment necessary to sustain continuous operation. Strategic sites in the U. S. defense network have already been selected for location of additional search radar systems.

This "tower of strength" in U. S. defenses underlines Sperry's advanced capabilities in radar—the result of experience dating back to radar's earliest beginnings and highlighted by many significant Sperry contributions to the science.

SPERRY

SURFACE ARMAMENT DIVISION, *SPERRY GYROSCOPE COMPANY, DIVISION OF SPERRY RAND CORPORATION, GREAT NECK, NEW YORK*

gory than a manned bomber force. Unlike the bomber crew which is able to correct errors in flight, the missile crew cannot correct errors after launch.

By their nature, missiles pose a new set of health and physical hazards to personnel. Missilemen will live with and handle highly combustible and toxic chemicals associated with liquid propellants. These hazards will be in addition to normal maintenance hazards such as noise and the movement of heavy equipment.

To provide medical support of missile operations, then, we must develop selection criteria to identify intelligent, technically proficient individuals capable of maintaining a high sense of responsibility in the face of monotony. We must identify the industrial and occupation hazards of missile operations, and establish safety measures, including protective equipment and emergency medical procedures. And we must develop organization and employment concepts to apply this medical support to a growing number of locations, which in many cases will be remote from established bases.

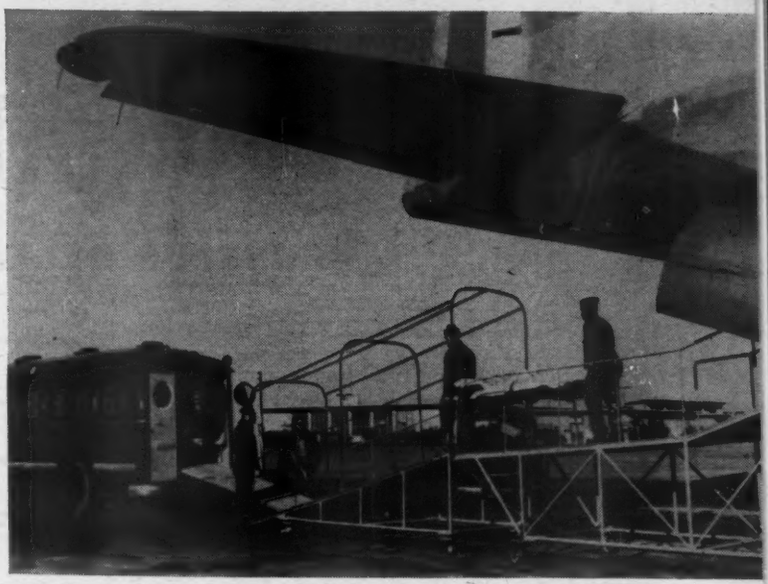
We are meeting the challenge imposed by the addition of missiles to the Air Force inventory through the three broad programs mentioned earlier—research, teaching, and clinical medicine.

Basic and applied research have established criteria for the psychological evaluation of personnel and the maximum permissible concentration limits of toxic materials. Research information has also been used to design and develop protective clothing and equipment to safeguard personnel. And the principles of sanitary and industrial hygiene engineering are being applied to the control hazards in handling toxic materials.

Leading a team of US Air Force aerospace medical experimenters, Dr. Bruno Balke, Aerospace Medical Center pioneer in study of human adaptation to rigorous environments, hikes with group during encampment at 12,000 feet.

Our training efforts have been directed to both medical and missile personnel. Courses conducted at the School of Aviation Medicine have been augmented with emphasis on occupational health and toxicological aspects of missile operations, and a course "The Medical Support of Missile Operations" was established at Cape Canaveral for medical instructors and staff officers. We have developed course outlines and training aids to teach missile personnel the medical aspects of the hazards of their duties.

The base, with its clinical facilities, is sufficiently flexible to meet the medical-support requirements of its satellite missile site. At the more remote locations, a duty technician and a basic first-aid station would be provided. A "circuit-riding" physician would conduct periodic physical examinations. In the event of serious accidents or illness, the patient would be evacuated to the support base medical facility, either by stand-by ambulance or air.



Worldwide USAF Medical Service pioneered in development of aeromedical evacuation techniques, notably during Korean War. Here a patient is transferred to ground bus-ambulance after mercy flight, is on way to base hospital.

The organization and programs of the Air Force Medical Service today are flexible, versatile, and responsive to change. Considering these and other aspects of our worldwide operation, I have no doubt but that in the years ahead we can continue to provide maximum medical support to the Air Force and complete clinical care for the Air Force man and his family.

In the decade ahead, the true conquest of space by man poses the most stimulating challenge yet encountered by Air Force medicine. In atmospheric flight, man has remained to a certain extent under the protection of the surrounding air. But a vertical rocket trajectory soon leaves the atmosphere behind and spaceflight is distinguished by a complete absence of an atmospheric medium.

The answers to many of the questions involving safe human spaceflight will, I hope, emerge from the many fine minds working in today's USAF medical research.

The practice of medicine is universally based upon mutual trust and understanding between the doctor and his patient. This same relationship of mutual trust and understanding must also underlie world peace if it is to be enduring.

In our practice of Air Force medicine worldwide, we have gained much from the mutual exchange of information with our friends of allied countries. Not only have we improved our professional knowledge, but also I hope have furthered understanding and trust among our peoples and the cause of world peace.—END

General Niess has devoted more than thirty years to military medicine in important posts around the globe with the Air Force. He became USAF Surgeon General in December of 1958, after a Far East tour as Command Surgeon of the Pacific Air Forces.

A LOOK AT BOUNDER

RUSSIA'S DELTA-WING BOMBER

RUSSIA is currently testing a bomber that exceeds the B-58 in size and has about the same speed. Code-named Bounder by NATO, the aircraft has delta wings, yet has retained the normal tail section with horizontal and vertical stabilizers.

The Bounder has been under test for some time at Ramensköye, the Russian flight test center near Moscow.

There are several versions of this long-range, high-speed airplane. At least six are known. This seems in keeping with the familiar Soviet technique of building many prototypes before deciding on the production item. The versions vary in size. One is said to be engaged in nuclear-power experiments. It is doubtful, however, that the Bounder has the type of airframe in which the Russians would ultimately place their nuclear engine.

One version of Bounder has a length of about 185 feet and a wingspan of sixty-six feet. It is powered by six turbojet engines with afterburners. Four of the engines are slung beneath the wings in pods. Two are buried in the wing roots.

Its speed capability is reported in the vicinity of Mach 2.

Though generally referred to as a bomber, the Bounder is understood to be designed to function as a missile carrier that could support ground troops and work over enemy ground positions. It can carry an estimated twenty air-to-ground guided missiles, each with a range of something over sixty miles.

The Bounder's basic construction is standard—a ribbed frame, long sections, metal covering. Radar equipment in the nose is dual purpose, providing all-weather capability and smelling out ground targets.

The cockpit is pressurized. Visibility to both front and rear is believed good. Even at the high angles of attack encountered during landing, the pilot is thought able to see quite well ahead of the airplane.

Armament is restricted to radar-controlled twin cannons in the tail. These are triggered through a friend-or-foe recognition device. The tail section also houses a ribbon parachute to provide additional braking action during landing.

Except for the center section, which contains bomb racks, and the cockpit area, much of the fuselage is taken up with fuel tanks.

The wings are of integral construction, with major forces exerted against three spars which encircle the two engines in the wing roots. The spars do not pass through the fuselage. They are connected to three large frame ribs.

This kind of construction, in conjunction with the low tension and the high setting of the spars, produces a rigid bracing that is low in weight and less costly in man hours during production.

Each wing is equipped with trim tabs, ailerons, and flaps. The wings do not have the sort of curvature seen in the B-58's wings.

The leading edge is swept back at about a sixty-degree angle. The mounts of the four engines suspended beneath the wings are extended up over the leading edge and to the upper surface of the wings, where they serve as flow fences.

The Fowler-type flaps are pushed out and down hydraulically for landing. The ailerons also are lowered during landing and act as "slotted" flaps. The normal function of the ailerons during landing is taken over by the trim tabs, which remain effective, despite the reduced slipstream.

Additional lift is provided by a nose flap, which extends over the entire width of the nose on the underside of the fuselage, and which, when fully extended, provides another twenty percent of lift area.

The landing weight is about 200,000 pounds, the landing speed about 135 miles an hour. Maximum gross weight is not known, although 250,000 is a good approximation. Takeoff speed fully loaded is estimated at about 170 miles an hour.

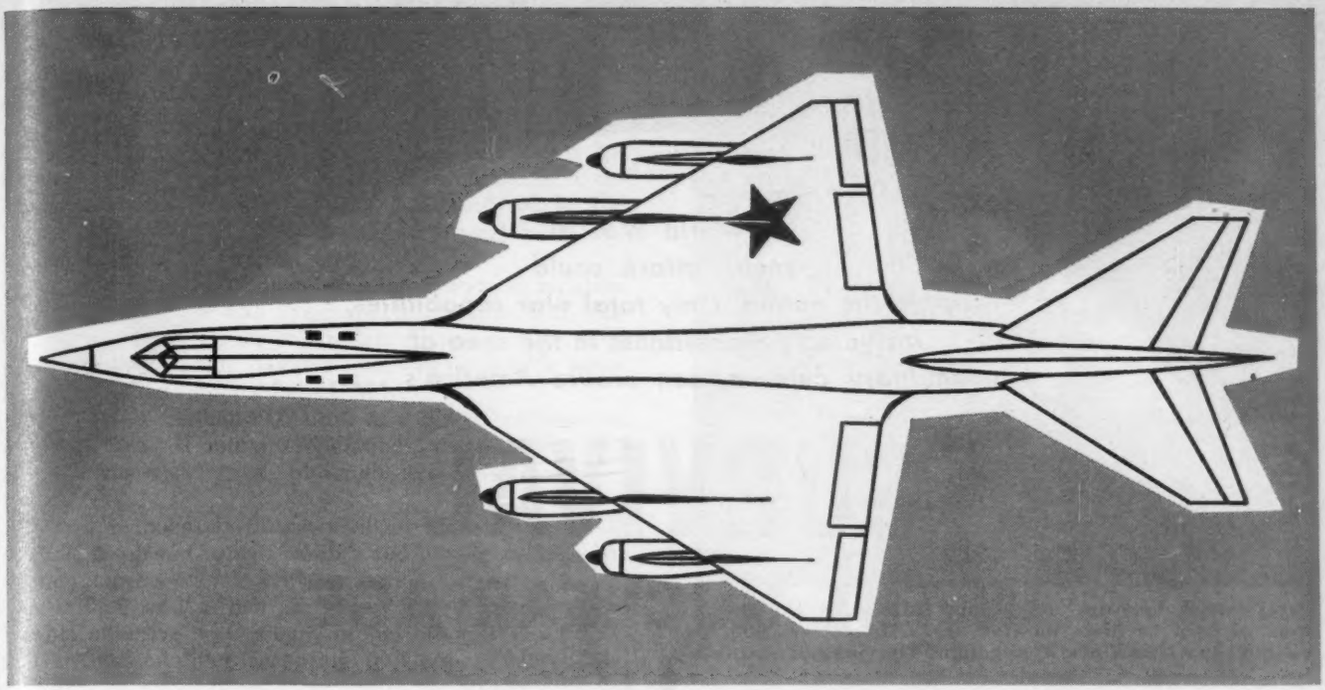
The six engines in the aircraft, each equipped with a short afterburner, deliver a total of 158,400 pounds of thrust at takeoff. The engines appear to be the latest military version of the AM-3 powerplant, which produces about 19,000 pounds thrust at sea level, with afterburners that yield another 7,000 pounds of thrust. Without afterburning, the engines are believed to have a specific fuel consumption between 0.80 and 0.90.

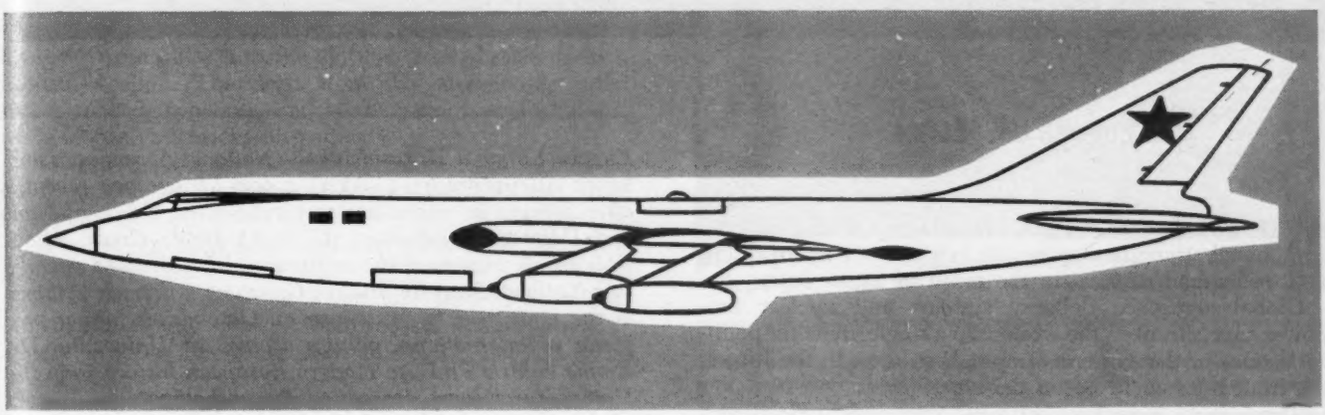
The Bounder, thanks to this thrust, gets off well and has a very fast rate of climb to top flight altitude of just under 60,000 feet. The aircraft has a range of 1,650 miles for maximum penetration and return to base, allowing twenty minutes for combat. This assumes the entire mission is carried out at maximum speed, or Mach 2. The aircraft is the longest-range high-speed aircraft the Russians appear to have built.

An interesting feature of this delta aircraft is the full empennage. This type of design first appeared in 1956 when the new Sukhoi prototype interceptors were unveiled on Soviet Aviation Day. Available evidence indicates the rudder is kept locked in position during high-speed flight, but during slower portions of a flight it is unlocked to afford greater control.

It is evident that the Soviets judge a conventional tail on an airplane to be advantageous. Undoubtedly it does give their aircraft greater maneuverability under certain conditions.

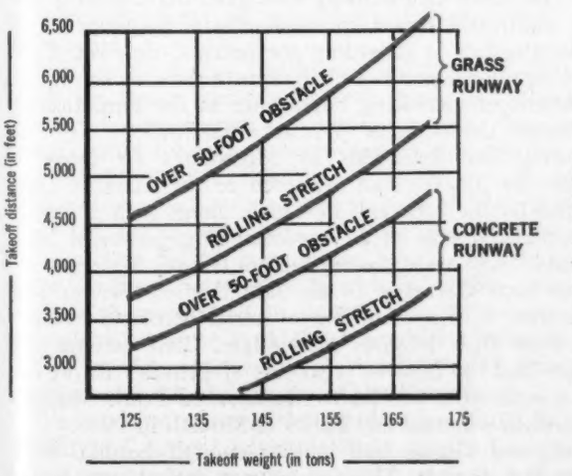
The Bounder is built to operate from good sod fields, despite its seeming great weight. This is in keeping with the Russian practice of designing landing gear that can be accommodated to grass landings and takeoffs. It will be recalled that even the large, four-engine Ukraina transport is designed for sod fields. In the case of the Bounder, this capability would be especially desirable in line with its optional mission to provide battlefield support of ground troops.—END



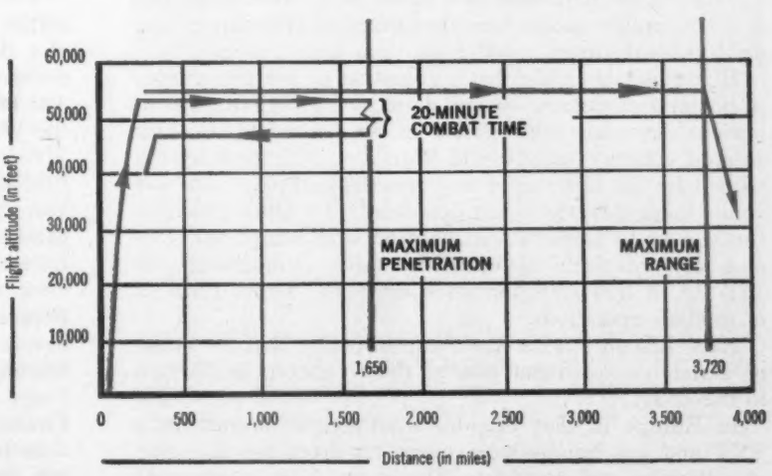


Above, top view of Bounder. One version of the delta-wing bomber is about 185 feet long and has a wingspan of 66 feet. Four of the six engines are slung beneath the wings in pods while the other two are buried in the wing roots. Below, side view shows Bounder's full empennage. Evidence indicates that the rudder is kept locked during high-speed flight.

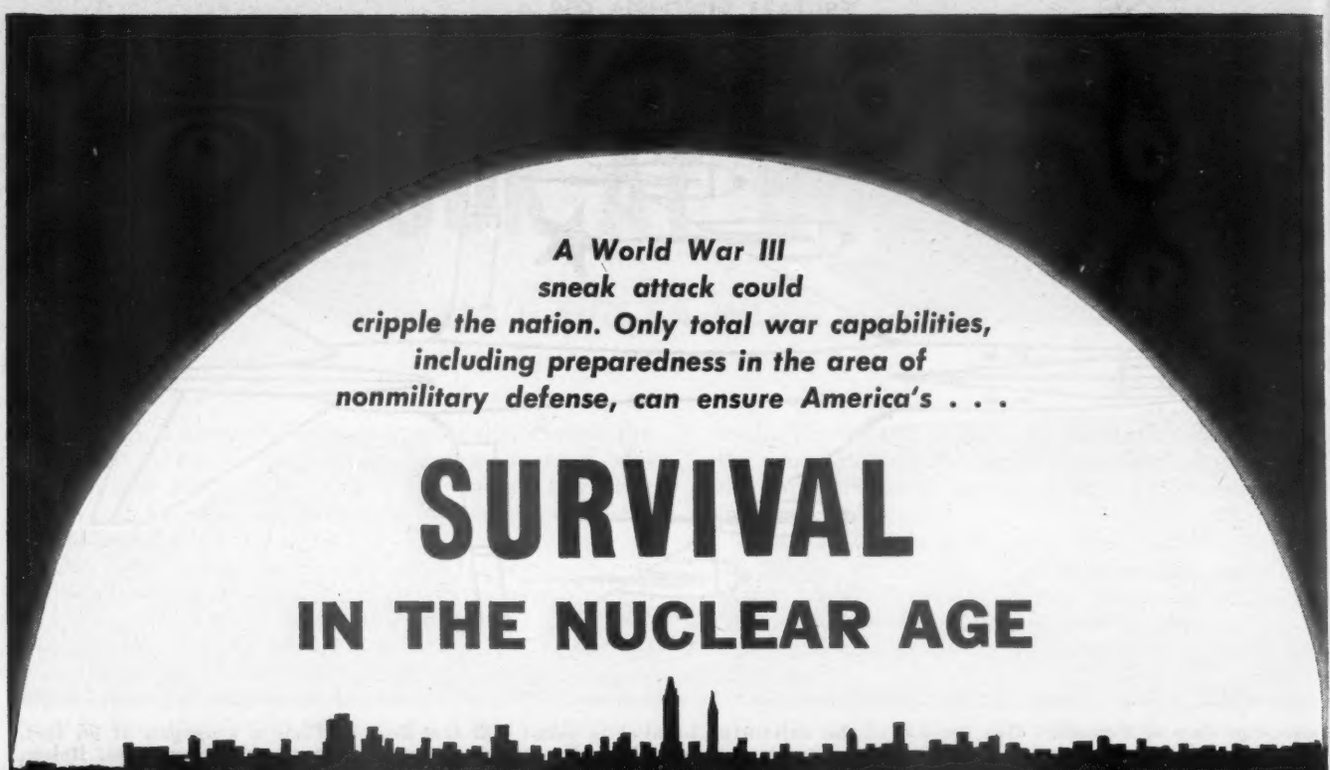
TAKEOFF DISTANCES OF BOUNDER



RANGE AND PENETRATION OF BOUNDER



Charts above summarize Bounder's performance. At left, takeoff distances with different weights and under varying conditions. Bounder's takeoff speed is estimated at about 170 mph. Chart at right shows the aircraft's fast rate of climb to flight altitude of just under 60,000 feet. The figures are in terms of Bounder's maximum speed of Mach 2.


A World War III
sneak attack could
cripple the nation. Only total war capabilities,
including preparedness in the area of
nonmilitary defense, can ensure America's . . .
SURVIVAL
IN THE NUCLEAR AGE

Eugene M. Emme

NONMILITARY defense, an old-new factor of national strength, may be the key to both national and individual survival in the event of future war.

Global aerospace delivery systems and nuclear firepower have shrunken the world into a single arena for political action—or the extreme of open hostilities. In the future, the front lines could be on the home front.

These facts have brought new appraisals, official and unofficial, in the area of nonmilitary defense, which includes civilian defense. The process appears to have taken place on both sides of the Iron Curtain.

This is a comparatively new problem for Americans. But it is not, unfortunately, for other peoples. This nation can, and obviously must, profit from their experiences.

It is understandable that recognition of the importance of nonmilitary defense—which dates to the siege of cities in ancient days—has come slowly in the United States. Our belated entrances into World Wars I and II were accompanied by the absence of any genuine prospect that war would come directly to our homeland. Our allies provided time for us to mobilize our resources and manpower. Our economy was little disrupted by tardy mobilization. In 1917-18, it had little influence upon the actual conduct of military operations.

How difficult it is for Americans to realize that the threat of aerial bombardment caused deep concern in Europe in the 1930s.

In Europe in that decade, short-legged aircraft with TNT and gas bombs were never far from the thoughts of statesmen and strategists. The young Nazi government in 1933 and 1934 fully exploited the peace treaty prohibition on a German air force to consolidate German public opinion behind their shaky regime.

Eugene Emme is Historian of the National Aeronautics and Space Administration (NASA), a post he assumed recently after serving in operations research in the Office of Civil and Defense Mobilization (OCDM), Battle Creek, Mich. This article consists of the substance of Dr. Emme's remarks to a National Security Studies Group civil defense seminar at the University of Wisconsin in October. A former professor of international politics at the Air University, Dr. Emme holds a Ph.D. in modern European history from the University of Iowa. He edited the anthology, The Impact of Air Power, *published this year by D. Van Nostrand.*

The Nazi elite also adroitly used civil defense as a domestic political weapon to demonstrate the superiority of a dictatorship in providing for national defense. Civil defense against massive air attack in a general European war became of increasing importance in the formation of the Western democracies' policies after 1935.

Bombing demonstrations by Mussolini's air force in Ethiopia, by the German air force in the Spanish Civil War, and by the Japanese in China, along with a propaganda-created image of an overwhelming, powerful Nazi Luftwaffe—these were among factors behind the appeasement of Nazi Germany in the late thirties. Britain and France were in desperate fear of aerial bombing and believed their civil defenses inadequate. Civil defense deficiencies and the relative weakness of Britain's Royal Air Force compared to the Luftwaffe haunted Prime Minister Chamberlain when he met Hitler at Munich in 1938.

Britain and France had neither enough hospital beds nor first-line aircraft. There were not enough gas masks to go around. The airpower of Britain and France, as well as their civil defense capabilities, were ineffective deterrents.

Two primary developments in the war that followed shaped today's need for nonmilitary defense.

First, the destructive effects of bombing upon the homelands of Britain, Germany, and Japan, including the atomic bombing of Hiroshima and Nagasaki, demonstrated what modern weapons can do. Second, World War II brought about a bipolar power orientation on the entire face of the earth. The militant world revolution of communism dominated the Eurasian heartland while the United States was left as the moral and physical backbone of the democratic world.

The postwar development of intercontinental bombers and missiles armed with thermonuclear bombs and warheads, themselves results of accelerated wartime development, has today made possible total war on a scale never before imagined in all of human history.

The total of civilian casualties as a direct consequence of World War II military operations, even under TNT attacks, was very great, although less than some had feared.

Sixty-one thousand British civilians were direct fatalities as a result of German bomber and missile sorties upon military targets over a five-year period.

A million and a half sorties by the Anglo-American bomber offensive on Germany proper brought about 250,000 civilian fatalities according to German figures, and 305,000 civilian fatalities according to the Strategic Bombing Survey. Seven and a half million Germans were made homeless as a result of air attack.

Massive TNT and incendiary attacks caused preatomic fire storms at Hamburg, Kassel, Darmstadt, and Dresden. Turbulent columns of heated air, hundreds of yards in diameter, rose miles into the sky like a mushroom from a nuclear weapon. The draft from the surrounding open spaces sucked in people, and broke trees three feet thick, while stones and bricks burned.

Between 60,000 and 100,000 Germans were killed in the fire storm at Hamburg in August 1943. In the great incendiary raid on Tokyo in March 1945, 94,000 persons were killed, an even larger number than at either Hiroshima or Nagasaki.

Today, with nuclear firepower, one bomber or missile can do the deadly work of hundreds of "conventionally" armed bombers. There are also radiological hazards to be considered.

The atomic bomb multiplied the explosive power of TNT blockbusters a thousandfold. We know that the thermonuclear bomb or warhead, in turn, multiplied the destructive power of the "nominal" or Hiroshima bomb, an additional thousandfold. And we are familiar with the radiological effects of windblown fallout which covers wide areas.

The factor of time has been revolutionized. Our allies could no longer provide us with time to mobilize our fighting forces, resources, and manpower. Our military forces would have their major test in the opening phase of a World War III with high requirements for preattack preparedness and in-being capabilities to absorb the nuclear assault, to fight back, and to recover. The effects of a nuclear bombing campaign would, in addition, involve the entire nation as a "battlefield" within hours.

From these facts, it is obvious that, in event of war, nonmilitary defense capabilities would be essential.

The second consequence of World War II, that of the creation of a bipolar world, is always with us.

War and peace are no longer distinguishable in today's world. The cutting edge of Soviet aggrandizement and, hence, its greatest weapon in "cold war" as well as "hot war," if it should come to that, is the Soviet's global nuclear firepower.

(Continued on following page)

Above, Allied bombs rain on an Austrian factory town; 61,000 British, 305,000 German civilians died in raids. Damage from aerial bombing in World War II was immense.

Downed P-47 at Normandy invasion. Plane played a major role in war. Today it seems puny in midst of nuclear age.

Mushroom cloud at Nevada nuclear test, fearful symbol of new weaponry that determines nonmilitary defense needs.

The unqualified success of America's Strategic Air Command in deterring gross Soviet ambitions in its dynamism of expansion was well documented during the decade after World War II when we alone had global-range nuclear firepower. But we should never forget that the Soviet Union absorbed terrific losses in manpower and industry during World War II and has restored its industry in accordance with dispersal and regional autarchy. This tends to lessen the potential deterrent threat of SAC.

The 16,000,000 Russians killed in World War II may give some Soviet military strategists an inkling that they might be able to survive a retaliatory nuclear attack if they can exploit the military initiative with a "preemptive" massive blow.

It is a historical fact that communism has never conquered a nation without the use or the threat of direct military force. Today, we witness the adroit use of nuclear blackmail embellished with Sputniks and Luniks to institute peaceful coexistence. The failure of Soviet "friendly persuasion" might buttress an already existing Soviet military doctrine that the United States can only be eliminated as the backbone of the free world and the last major remaining threat to world communism by war itself.

In the aerospace-nuclear age, of course, it is all important to remember that wartime ascendancy, perhaps the war decision itself, could accrue to that side which initiates massive nuclear attack. This fact must be at the core of all strategic thinking regarding nonmilitary defense. There seems no question that the United States would ever initiate a strategic attack.

Thus we must consider enemy capabilities upon the variable of whether or not they could ever come to rationalize that the advantages of initiating an attack outweighed the damage to be suffered in a retaliatory attack by what remained of SAC. In this assessment of the reciprocal strategic situation, nonmilitary defense capabilities come into play.

No doubt exists today that the Soviet armed forces have developed a powerful nuclear capability, one endowed with global-range delivery in the form of jet Bison and turboprop Bear heavy bombers; IRBMs with 1,500-mile range covering targets in Europe and North Africa; long-range snorkel submarines possessing guided and perhaps ballistic missiles, and, in the 1960s, increasing numbers of ICBMs with nuclear warheads.

The Russians have done this without appreciably weakening their capability to fight conventional and limited war. The Soviets could strike a massive, sudden atomic blow at Strategic Air Command bomber and missile bases and/or American cities. Even under a purely military attack, radioactive fallout would threaten the survival of downwind and unsheltered populations.

The USSR, for its part, maintains a civil defense system controlled by the central government in Moscow through its Ministry of Internal Affairs. It is known by the abbreviation MPVO, and has a professional corps of full-time civilian personnel. MPVO functions with varying degrees of effectiveness at all levels of government, local as well as nationwide. They have a voice in city planning. It is in a position to press for the dispersal of industry and the incorporation of shelter in new construction.

Most evident is the wide impact upon the Russian population of a massive civilian training program operated by the Communist Party. DOSAAF, the Voluntary Society for the Cooperation with the Army, Air Force, and Navy, has a membership in excess of 20,000,000. Each of its members takes a compulsory course in civil defense, and, in addition, the Soviet Red Cross trains millions.

But even beyond the DOSAAF and Red Cross programs, the Soviet regime has announced that it is presently conducting civil defense training courses of twenty-two hours of required instruction for every one of the more than 200,000,000 Soviet citizens. The quality of this instruction is not known.

The problem of civil defense differs in the USSR from that in our own nation.

- First, the Soviet program is compulsory rather than voluntary.
- Second, Soviet industrial and population centers are more widely dispersed just by reason of geography and the problem of space in their economic development.
- Third, the Soviet civil defense program operates on a concealed budget.
- Fourth, after many years of regimentation, the Soviet population would probably respond in a more disciplined manner to any civil defense directives that might be issued, in contrast to the response in a free society without the compulsion of coercion.
- And finally, the control mechanism of the Soviet regime can readily mobilize materiel and personnel for civil defense on short notice. Civil defense is not a political or economic problem in the conventional American sense in the Soviet Union.

In the final analysis, the world balance of power, today and tomorrow, rests upon a capability for total war on a global scale.

The rise of the modern technology of war, in combination with the ambitions of Soviet Russia, has made necessary the creation of offensive and defensive military forces capable of dissuading the would-be aggressor from nuclear aggression and, if necessary, of enabling us to strike back.

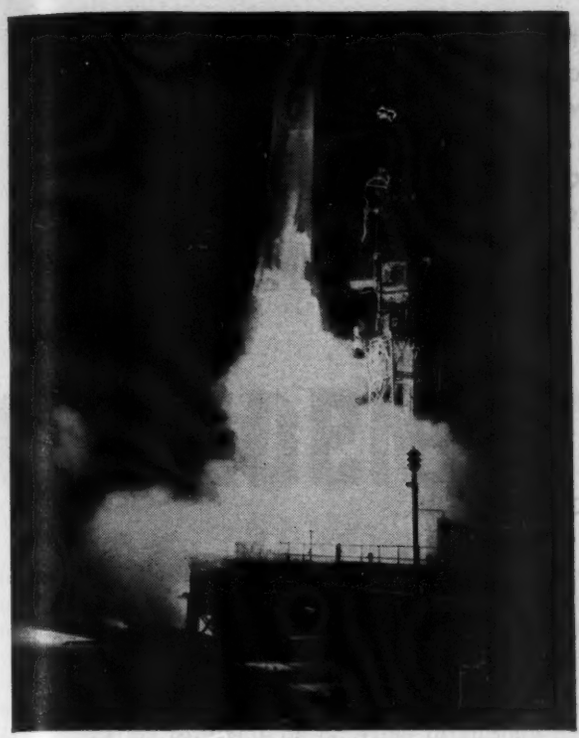
But, the military forces of offense and defense cannot fully guarantee that a potential aggressor will turn aside a mad impulse to attack. Neither can they prevent the exposure of the civilian populace to death and destruction should the enemy attack.

No active defense yet exists against ICBMs, and no 100 percent effective active defense against bombers is promised by any commander. Only that part of the Navy and the Army which can strike Soviet bomber bases and missile launch sites can be considered a part of our first line of defense. Americans at home would be on the receiving end of the enemy's global-legged nuclear firepower.

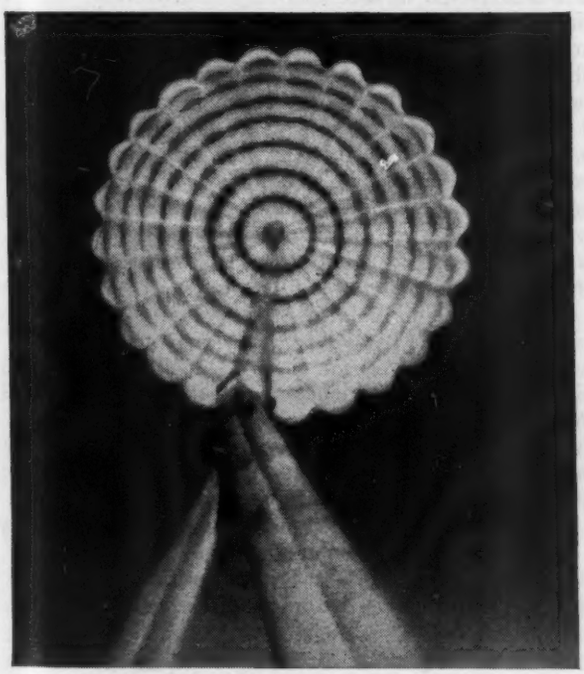
A nuclear World War III, of course, is neither inevitable nor impossible. But for Americans, a unique history with regard to warfare is no longer applicable in providing a sound strategic guidance in working out our own security or that of our friends. No longer will oceanic moats and friendly neighbors dictate that the immediate bloodshed and destruction of a general war will not visit American soil with the opening shot. A Pearl Harbor in a World War III could come to the entire nation within hours.

Our "arsenal of democracy" efforts and our belated victories in recent world wars offer no comfort for the future. We have never suffered an air attack, not even one featuring the attack of a single airplane with a single TNT bomb.

The more physically unprepared we are as a nation for the total requirements, military and nonmilitary, of total war, the more tempting we are as a physical target. And the more tempted we may be by blackmail persuasion directed at us to surrender piecemeal some our our strategic assets, our democratic friends, and our ideological inheritance of individual freedom.—END



THE ATLAS MISSILE LAUNCHED NASA'S one-ton instrumented capsule similar to the one that will carry a man into space orbit. Initial landing phase began at 45,000 feet when a barometric switch fired a charge which deployed a Radioplane stabilization parachute directly aft into the airstream. At the same time, radar chaff was ejected to scatter into a 600-square-foot pattern to provide for radar locating and tracking.



AT 10,000 FEET another barometric switch initiated release of the stabilization 'chute and deployment of the 63-foot Radioplane Ringsail landing 'chute to safely lower "Big Joe" in its 30-feet-per-second descent. Upon water contact, a pyrotechnic charge released the Ringsail. Recovery was completed when a U.S. Navy destroyer, guided to the capsule by radar, lifted the undamaged "Big Joe" space capsule from the Atlantic.

NEWS IS HAPPENING AT NORTHROP

AFTER SPACE FLIGHT RADIOPLANE'S RINGSAIL BRINGS "BIG JOE"–NASA'S ONE-TON CAPSULE–TO SAFE LANDING

Recently the Space Task Group of the National Aeronautics and Space Administration sent its "Big Joe" capsule into space and successfully recovered it hundreds of miles down-range from Cape Canaveral. The landing system included a 6-foot conical ribbon stabilization parachute and a 63-foot landing parachute, the Ringsail. Both 'chutes, supplied by Radioplane, are proof of new advances in paradynamics.

Radioplane, also chosen by McDonnell Aircraft Corporation to develop and supply the landing system for NASA's Project Mercury, salutes its associates on this achievement. The success of this demonstration shows the ability to bring a man home safely after orbital flight.

RADIOPLANE

A Division of **NORTHROP CORPORATION**

Van Nuys, California, and El Paso, Texas

"The lesson of our recent history is that every time the men in authority decided that some problem was too tough for democracy to lick, and that they had to evade the problem in order to save democracy, we have gotten into a quite deep hole; and in all but the [present] case, where the bill is still to be reckoned, democracy was, in the end, much more searchingly and dangerously threatened than if the challenge had been accepted in the first place, at an early stage of the difficulty . . ."

THE SOVIET C

TO UNDERSTAND the real nature of the Soviet challenge—and what the Soviet government evidently means by "competitive coexistence"—it is necessary now to go beyond economic analysis and consider what Moscow is trying to accomplish.

Although Soviet policy objectives are primarily military, political, and psychological, they are based on an economic fact: the arrival of Russia at technological maturity. This means that the Soviet Union has the resources and technological capacity to mount a wider variety of military and economic programs than in the past. In the immediate postwar years, for example, the Soviet military threat was confined to the power of the Red Army. At the present time, it controls a full spectrum of military power ranging from ICBMs to conventional infantry and, one might add, "volunteers." A decade or so ago, Soviet trade and credit operations as well as technical assistance programs on the present scale would have been unthinkable. At the present time the Soviet Union has the evident capacity to conduct such operations on a regular expanding basis if it chooses to do so.

Here one specific aspect of the Soviet growth rate should be noted. A six percent rate of increase in Soviet GNP means that the government disposes each year of something like the equivalent of $12 billion for whatever purpose it chooses. Although the level of American gross national product is more than twice that of the Soviet Union, an average growth rate of three percent means that the American economy as a whole—not the government—disposes of an increment of, say, only some $15 billion. I shall consider later the implications of the different procedures for allocating this increment; but in the discussion of specific dimensions of Soviet policy which follows, the wide range of capabilities and the flexibility afforded by government control over an annual increment not much less than our own should be borne in mind.

The Threat of Major War

The main weight of Soviet policy is being articulated to the Russian peoples and to the world in terms of a nonmilitary struggle, which is, indeed, being energetically and frankly pursued. But there is no evidence whatsoever that the Soviet military effort is being reduced; and there are no grounds for building American policy on the assumption that if the Soviet government believed that it enjoyed a sufficient advantage in nuclear weapons to take out American retaliatory power at a blow, it would not do so. Inhibitions may well exist in the Soviet political system against such a course of action; but there is no objective basis for believing that the United States would be safe should the gap in military capabilities be permitted to open to such an extent. Put another way, we Americans have no right before man or God to tempt Moscow's planners with this possibility. At the present time and for some years—until we create a highly dispersed deterrent system—our ability to make this course of action irrational appears to hinge on an ability to get sufficient advance warning of a Soviet missile attack to put our bombers in the air; and on the pace at which we "harden" our bases. These slender threads on which American safety now rests illustrate the dangers of analyzing the Soviet threat in conventional economic terms. Essentially since 1953 when the mounting of a fusion bomb in a rocket became feasible, the Soviet Union has made a plunge for primacy in this particular weapon system. The American military danger arises from the advantage Russia has achieved in this relatively narrow area, rather than from the rough equivalence in American and Soviet total military outlays in recent years. Although it is evident that the Soviet government is not building its policy on the certainty or even likelihood that it will get far enough ahead of the United States to take out our retaliatory power at a blow, its allocations for military purposes (including air defense) and the military doctrines now developing within the Soviet military establishment are wholly consistent with a missile salvo being regarded as one among several possible routes to world primacy—coexistence or no coexistence.

The Threat of Limited War

Similarly, there is no evidence in Soviet military allocations nor in Soviet military doctrine that the use of arms short of an all-out atomic war has been ruled out. On the contrary, the evidence remains that the Soviet Union has continued to modernize its ground force in ways which would make possible combat with either conventional or tactical atomic weapons. Moreover, just as the Geneva Conference of 1955 was accompanied by the disruptive Czech arms deal with Egypt, the present exploration of the possibilities of arms reduction and control is accompanied by Chinese Communist incursions across their southern border. This lively threat is, again, not illuminated by comparative economic analysis of the Russian and American economies.

And we must look at the problem of building deterrence to limited war in even broader terms.

First, there is the fact that, since 1947—from the threat to Greece and Turkey to the latest attacks on Quemoy and Matsu—we have in the end met limited aggression not by using strategic airpower with nuclear weapons,

W. W. Rostow
PROFESSOR OF ECONOMIC HISTORY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

CHALLENGE

Herewith, only slightly condensed, is the summary of a massive, and most enlightening, three-volume report compiled at the request of the Subcommittee of Economic Statistics of the Joint Economic Committee of the Congress. The report represents the combined efforts of an impressive panel of experts in a wide variety of fields. The summary, to which we commend your attention in these pages, was written by Professor W. W. Rostow, who is Professor of Economic History at the Massachusetts Institute of Technology and a staff member of the Center of International Studies. If you are sincerely worried about how much this nation can afford to pay for its continued existence, we suggest a careful study of Professor Rostow's conclusions.—THE EDITORS

but by hurriedly mobilizing some form of limited countermeasure. There has been a gap between our emphasis on nuclear weapons in diplomatic theory and budget allocations on the one hand, and our policy when the chips were down, on the other. It is quite likely that if we and our opponents understood better how we would in fact behave, in the face of limited aggression, we would have seen fewer forays across the truce lines since the end of World War II. Our concentration on the big weapons has tempted them in the past and may tempt them again.

Second, in Europe we now confront a situation where our allies are increasingly unwilling to accept a situation where limited aggression may still occur and their only recourse is to rely on counterattack with nuclear weapons under circumstances where Soviet missiles could evidently overwhelm them and where the United States would have to reckon on direct attack. Increasingly, thoughtful Europeans have come to understand that stability in that region demands increased nonnuclear strength.

Finally, and perhaps most important of all, we must begin to understand that if we make progress toward placing nuclear weapons under international control, we must have an alternative conventional basis for maintaining security. In the long run, by slow stages, we may well move, if all goes well, to very low levels of armaments of all types. In that process, however, we cannot negotiate confidently and safely unless we can mount alternative forms of defense, should a breakthrough come that would neutralize nuclear weapons.

In short, the nature of the Soviet challenge—including the Soviet challenge to put forward concrete proposals for step-by-step movement toward the control of nuclear armaments—requires that we take the problem of deterring limited aggression much more seriously than we have done in the past fifteen years.

Diplomatic Blackmail

Since the early months of 1956 down through the Berlin crisis, the Soviet Union has on a number of occasions used the threat of its missile capabilities to strengthen the hand of its diplomacy. Again, this is a form of threat which cannot be defined with reference to economic analysis. It comes, in the end, to a simple test of nerve and will.

The Political Penetration of the Underdeveloped Areas

Soviet policy in Asia, the Middle East, Africa, and Latin America is increasingly discussed under the heading of "The Economic Offensive." This leads to complicated efforts to compare the scale of Soviet and American aid on a quantitative basis. And, indeed, it is quite clear that Soviet technical and economic assistance to underdeveloped areas in the free world as well as Soviet trade policy have been significant forms for creating areas of political influence and sympathy in various parts of the world. But analysis confined to these familiar dimensions misses the main point and the fundamental nature of the Soviet threat. It is quite evident from Communist thought, writing, and policy that their goal in Asia, the Middle East, Africa, and parts of Latin America is a repetition in some form of the story of China from, say, 1927 to 1949; that is, Soviet analysts look to a progressive failure of the non-Communist regimes in these areas to solve the problems of modernization and economic growth, leading to frustration, internal turmoil, and to acceptance of the Communist alternative as a way of organizing these transitional societies. Thus, the central challenge confronting the United States and the Western world in the underdeveloped areas is not, somehow, to outstrip Russian loans and technical assistance. The challenge is to mount our own positive long-term policies designed to maximize the chance that these transitional societies will emerge into modernization without losing their independence and without foreclosing the possibility of progressively more democratic political development. Additional American and free world resources are required in this effort; and Soviet aid and trade policies play some role in the mounting of this challenge—which is, I believe, the route to world power that Moscow now regards as most likely. But to understand and deal with that challenge we must abandon a numbers racket approach and look directly and with insight at the problems of traditional societies and what we can do to help them.

The Psychological Image

It is clear that Soviet policy is immensely alert to the possibility of exploiting schisms as among the Western European nations and as between Western Europe and the United States. Offers of East-West trade play some part in this Soviet policy; but its primary tools are military, political, and psychological—combined with the fact that Moscow controls Eastern Germany and, therefore, the possibility of German unity.

This major Soviet effort is only obliquely related to Soviet and American growth rates; and the American response lies in the area of new ideas and institutional arrangements within the Western Alliance—which is now

(Continued on following page)

very rich—rather than in new American expenditures.

In support of these various efforts to achieve or to prepare for a breakthrough to world primacy, the Soviet Union is mounting a remarkable and sustained effort to project to the external world and to the Russian peoples a quite particular image. That image is of an ardent, energetic, and technically competent competitor closing fast on—and preparing to supersede—a front runner who has lost the capacity to deal with his problems and prefers to go down in the style to which he has become accustomed rather than to maintain his position. Leaving aside the various American contributions to the persuasiveness of this image in the outside world, this campaign has its foundations in three dimensions of Soviet policy: a somewhat dubious numerical approach to "catching up" with the American economy which, nevertheless, is rooted in the high momentum and technological maturity of the Soviet economy; an exceedingly solid set of Soviet achievements in missiles technology (military and nonmilitary); and a sporadically successful projection of the Soviet Union as the leader in the quest for peace. At home, the building of Soviet policy around the objective of catching up with the United States and with the American standards of living has proved an exceedingly successful device for unifying Soviet society, appealing as it does to three strong motivations evident in the Russian peoples: a deep nationalist pride, a desire for higher standards of living, and a passion for peace. In these dimensions of the Soviet challenge, the high momentum of the Soviet economy has played some part, but it is by no means the sole basis of the challenge.

The American Agenda

We turn now to the following question: In the light of the purposes of our society, at home and on the world scene, what lines of action are suggested by these multiple Soviet challenges; and what role, if any, does the growth rate and economic policy play in shaping an effective American response?

The elements in an effective American military and foreign policy are, I suspect, quite clear to us all and likely to command something of a consensus. They come to this. By our military dispositions, we must continue to make either major or limited war an irrational undertaking for Communists. On this basis we must use our economic resources and our political and human insight to the full in doing what we can to ensure that the nations of Asia, Middle East, Africa, and Latin America remain independent and move through their difficult transitions to modernization in ways which keep open the possibility of a democratic evolution for their societies. In order to execute these military and creative missions, we must form up a new set of relationships with the resurgent nations of Western Europe and Japan. And from this solid free world base, we must maintain an endless diplomatic initiative and an endless sympathetic dialogue with the Soviet leadership seeking to exploit every serious possibility for movement toward the effective international control of armaments.

In three categories this requires more American public expenditure: to be specific (but not necessarily inclusive) to "harden" American bases in the period of Soviet missile advantage; to provide an adequate airlift for the deterrence of limited war; and to develop an American contribution to an international aid scheme for underdeveloped areas which would be adequate to the task.

I am not prepared to estimate the amount by which American public expenditures need to be increased to cover these three policy objectives; but I would say this much. It is perfectly clear that the United States is not so poor that it cannot pay the bill for an adequate national effort; nor does the difficulty lie in the potentials for American growth over, say, the next decade. The problem lies in the attitudes of mind and the procedures we bring to bear in allocating resources for public purposes; and it lies in the way we are seeking to handle the problem of inflation. It is to these themes that I now turn.

The Potentials of American Growth

The potentials for American growth in the next decade would, I believe, permit us both chronic full employment and one of those surges of growth which transcend the long period average of three percent per annum increase in GNP. I am a little skeptical that we can attain five percent rate of increase; but a four percent rate of increase could be within our grasp if our growth potentials are fully and well used. I hold this view because there are three powerful expansionary forces now operating within the American economy: the rise in population, the acceleration of research and development, and the society's massive requirements for social overhead capital. A four percent growth in GNP would yield our society an annual increment for all purposes of well over $20 billion over the next decade. The first proposition is, therefore, that I can envisage no increase in American public outlays required to deal with the Soviet threats which could not easily be met by a society with over a $500 billion GNP and a more than $20 billion annual increment in GNP.

The achievement of a high rate of growth is, however, neither automatic nor assured; we shall have to find new ways of handling the inflation problem, and we shall have to take special steps to assure that the potentials for productivity increase are, in fact, exploited. These matters are considered below. But first it is necessary to examine directly our most fundamental problem—the American method for allocating resources between the private and public sectors.

The Allocation Problem

The root cause of our difficulty lies not in our income or our growth potential but in certain American habits of mind, carried over from earlier phases of our history, and in the workings of the political process, as they affect the allocation of resources. This interplay of intellectual conception and conventional politics conspires to make it difficult for Americans to increase the scale of public outlays except at moments of acute crisis. Here lies a danger to the national interest as well as a threat to the quality of American society.

Specifically, the working concept of modern economics encourages the view that public outlays should be accommodated to the natural ebb and flow of the private sector, perhaps to be expanded at times of recession but certainly to be restrained when the private sectors exhibit high momentum. This perspective, carried over inappropriately from an era of depression and peace to a time of chronic cold war and secular expansion, constitutes a powerful deterrent to outlays in the public sector, especially at a time of chronic prosperity; for it renders difficult a rational choice between marginal outlays in the public and private sectors, without extraordinary exertions of political leadership which have not been forthcoming. Without such efforts, the calculation takes the form of a crude clash between the

total claims of the state as against the individual family budget, in which the latter enjoys an evident prima facie advantage. The existing level of taxation acquires a degree of acceptability as citizens accommodate themselves to its burdens. Familiarity breeds not contempt but stoicism. Lacking a concerted effort of political leadership to dramatize the meaning of marginal shifts from the private to the public sector, it is difficult to generate the political base for tax increases or other forms of restraint on private outlays; *e.g.*, checks on installment spending. This leads politicians, except under acute crisis circumstances, to work out the pattern of public outlays within ceilings determined by what the existing tax schedules—the arbitrary product of the last acute crisis—will yield at existing levels of income, if indeed it does not lead to inappropriate tax reductions.

It is essentially these two features of the American scene which have made our response to the changing directions of challenge in the cold war so sluggish on the one hand and convulsive on the other. Neither our concepts of political economy nor our notions of politics have made it possible to deal with threats to the national interest in a forehanded flexible way. We have shifted erratically from the moods and political economy of peace to those of war. In the interval between, say, mid-1948 and the attack in Korea, for example, men in responsibility came to believe that a military budget beyond $15 billion was a threat to the American way of life. After the convulsive reaction to the Korean War had lifted military outlays more than threefold, this new range became again accepted as a line to be defended with a quite irrational ideological fervor.

The heart of the Soviet challenge lies, then, in presenting us with a situation where our interests may be eroded away, without palpable crisis, to a point where a traditional convulsive American response will no longer suffice. Our conceptions and methods of allocation to the public sector are inappropriate to a world caught up in a technological arms race and a slow grinding struggle for power and ideological conceptions in the underdeveloped areas. It is not the Soviet growth rate we need fear but a mode of American allocation which tends to imprison us at a level of public outlays determined by our arbitrary response to the last major crisis.

The Inflation Problem

The allocation problem has been made more difficult in recent years by the way we have thought and acted with respect to inflation. The debate on inflation in the Western world has been dominated by men whose training has led them to examine prices almost wholly in terms of effective demand. One school says that effective demand must be restrained by fiscal and monetary means if prices are to remain constant, even at the cost of a low rate of growth. The other school says that effective demand must be sufficient to maintain full employment and rapid growth, even if this means a steady rise in prices. Both lines of thought derive directly from the experiences and concepts of the interwar years.

It is time that we freed ourselves from the vocabulary and concepts and quarrels of an earlier generation. It is time that we looked squarely at the situation as it is on the eve of the 1960s. It is time that we accepted the challenge to create a policy of full employment without inflation. Here I would echo de Tocqueville's statement: "In politics one perishes from too much memory."

In my view the inflation problem of the 1950s is only superficially to be analyzed as the product of a peculiar wage push or effective demand pull. More fundamentally it arises from a historical change in the institutional methods and attitudes brought to bear in setting industrial and farm prices on the one hand and wages on the other.

These changes have two effects. First they render it difficult to pass along productivity increases in lower prices. The common expectation is that prices can only move in one direction: up. In turn, this throws almost the whole burden of achieving a rise in real wages on money wage negotiations, where the expectation is that money wages also can only rise. This expectation forces businessmen to seek to hedge, in order to protect their profits, and labor leaders to hedge in order to protect the real wages of labor. . . .

The challenge confronting our democracy is to change the setting in which price and wage policies are established and to make the public interest and public presence felt. We must fashion price and wage policies under chronic high employment conditions, which are judged equitable and which allocate increases in real income by some method other than that we now have; that is, a method where money wage rates are increased more than the rise in average productivity, and then corrected by inflation. There appears to be no way of achieving a better result via conventional fiscal and monetary policy, without also bringing about changes in price policy which would permit a substantial part of the increase in real wages to assume the form of price decreases made possible by higher productivity. In this connection, it is an often forgotten lesson of economic history that periods of relative peace in labor relations have tended also to be periods of declining trend in living costs.

The Relevance of the Growth Rate

Having tried to break through the Soviet economic data to identify the concrete dimensions of the Soviet challenge and to break through the American statistics to identify the real nature of our problem, let me say a word about the US growth rate. As Report IV of the Rockefeller Brothers Fund special studies project dramatized, a high rate of growth in gross national product makes it possible to enlarge both private income per head and public outlays, at existing tax rates. Put another way, the higher the growth rate, the less the potential clash between the claims of the two sectors. But a high rate of growth, in itself, does not guarantee that the public sector will be adequately supplied with resources: for the American allocation system does not automatically maintain constant fixed percentage allocations to various purposes (assuming for a moment that such a system would yield increases adequate to the national interest at high rates of growth in GNP). Without purposeful efforts the natural tendency of the American system is for public outlays to decline as a percentage of total resources, except at intervals of acknowledged crisis.

In fact, as a rough approximation, it is quite accurate to identify the Soviet advantage over the United States as consisting in a more stable percentage allocation to military and foreign policy sectors, starting from a high initial percentage base, at a time of rapid increase in Soviet GNP. Soviet allocations follow a regular path of expansion accommodated to the high rate of growth of GNP. American allocations follow a convulsive path, moving from plateau to (downward sloping) plateau, as crises dictate.

There is every reason for us to seek a higher American rate of growth, and notably an accelerated increase in productivity. Such an achievement could ease the problem of allocation and ease the problem of inflation. But it would

(Continued on following page)

not automatically remove from us the hard choices of allocation, nor would it remove the challenge to the democratic process represented by the need to control inflation without stagnation or damping the rate of growth. . . .

Can the Democratic Process Solve These Problems?

The burden of this argument is, then, that the challenges the nation confronts, finally, have major economic dimensions: The challenges of adequate and forehanded allocation to the public sector; of dealing with inflation without damping the rate of growth; of creating an environment and a public policy which would accelerate the rise of productivity on a broad front. Each of these is a direct challenge to the vitality of the democratic political process in the United States. As members of the Joint Economic Committee are well aware, there are many Americans (including, I would surmise, certain of your panelists) who would take the view that efforts by the American political process to come to grips with them would inevitably result either in more economic loss than the gain sought; or, in political damage to our society which would outweigh the possible economic gain.

One can reply that other democratic societies have, at various times, dealt more or less successfully with each of these problems, without losing their fundamental values; for example, the American Marshall Plan effort of 1947-48, conducted without the stimulus of military operations, but with strong political leadership which succeeded in getting support for a quite sharp increase in the public budget; for example, the efforts of the Netherlands to accommodate real wages to the average level of productivity increase in the economy; for example, the performance of Western Europeans, at our strong urging, in stimulating substantial productivity increases after the second World War.

But it would be wrong to rest the American case for accepting this tough agenda merely on the basis of analogy. Times are different, nations differ, and problems are never quite the same.

The real case must be negative on the one hand, positive on the other.

Negatively we know that four of our worst mistakes in modern history arose from a fear that our democracy could not deal with the problems it faced, without losing its essence. I refer, of course, to the belief of the Republican Administration after 1929 that it could not deal with the great depression without risking unacceptable damage to capitalism; to the belief of isolationists in both parties that we could not deal with Hitler and the Axis without permanently damaging basic qualities in our society; to the belief of the Democratic Administration before June 1950 that our society could not afford a military budget of more than $15 billion; and, I would add, the similar belief of the present Administration that its overriding mission has been to reduce the public budget it inherited, despite the accelerated challenge it has faced since 1953 in many dimensions.

The lesson of our recent history is that every time the men in authority decided that some problem was too tough for democracy to lick, and that they had to evade the problem in order to save democracy, we have gotten into a quite deep hole; and in all but the fourth case, where the bill is still to be reckoned, democracy was, in the end, much more searchingly and dangerously threatened than if the challenge had been accepted in the first place, at an early stage of the difficulty.

But there is a positive case as well. The positive case is not only that the democratic technique, energetically applied, has proved capable of handling such awkward problems as severe unemployment, major war, and limited war; it is also the simple faith that if any problem is soluble by human beings it is best solved, in the long run, by responsible free men, subject to the mixture of freedom and self-discipline which is the essence of the democratic process when it works. Without that faith the struggle in which we are engaged lacks meaning.

Our experience of the past century and three-quarters should convince us that the democratic process in the United States is tough, resilient, and capable of handling whatever problems the flow of history may place on our agenda.

A Conclusion

Now, a final word. Khrushchev's Russia is not the first nation to arrive at technological maturity, feel its oats, look over the field, and decide the old front runner was ripe for the taking. In our own time we have faced such moods and policies from Germany and Japan.

In the past these fast-closing nations have been persuaded to accept the fact that the world was not their oyster and to settle down as part of the international community only by defeat in major war. Major war was then necessary because the older powers did not so conduct themselves as to make major war a totally irrational undertaking.

In Russia we do not face a nation irrevocably committed to pursue power by major war unless we tempt it beyond endurance by our weakness during the period of the missile gap. The main hope for Soviet world leadership lies in various other dimensions, notably in their hope that the Western world and the democratic principle will fail in Asia, the Middle East, Africa, and Latin America. Moreover, I believe that there may well be men in Russia who already perceive that the rise of new nations, in the southern half of the globe, and in China, in a world of atomic weapons, may require a much higher degree of collaboration with the United States than even Khrushchev's challenge to compete peacefully would imply; they may begin to count not on burying us, but on making common cause with us over a widening range of problems. The discussions about ending H-bomb tests, with all they imply about Moscow's worries concerning the spread of atomic weapons, are a small beginning in this direction.

I doubt very much that Mr. Khrushchev is sure exactly where peaceful coexistence will end: in a missile salvo; in a protracted and dangerous struggle in the underdeveloped areas; or in a peace in which Russia accepts its destiny as a very great power, in a world of many diverse substantial powers. The answer lies not in the Kremlin's plans, but in what the free world does or fails to do, notably over the next decade. It is too much to ask of Russians at this stage of their history not to exploit every weakness we may offer. It is the strength and effectiveness of our response to the Soviet challenge—in all of its dimensions—which will determine the final meaning of peaceful coexistence.

Between now and 1970 a decisive test will take place. The real lesson of your panelists' papers is that there is nothing in the structure or growth rates of the two economies that will automatically determine the outcome of this test. The answer lies in whether our political leadership mobilizes the evidently ample resources that lie to hand—resources of will, of skill, of talent, of commitment to the American heritage, as well as goods and services—to do the job.—END

THE SPACE AGE IN PERSPECTIVE

SPACE DIGEST

VOLUME 3, NUMBER 1 • JANUARY 1960

Contents

1960—*Space* Election Year
William Leavitt 59

The Military Potential of the Moon
Lt. Col. S. E. Singer, USAF 62

Space Realism
Lt. Gen. Bernard A. Schriever, USAF 66

The Stakes in the Space Race
Dr. Eberhardt Rechtin 67

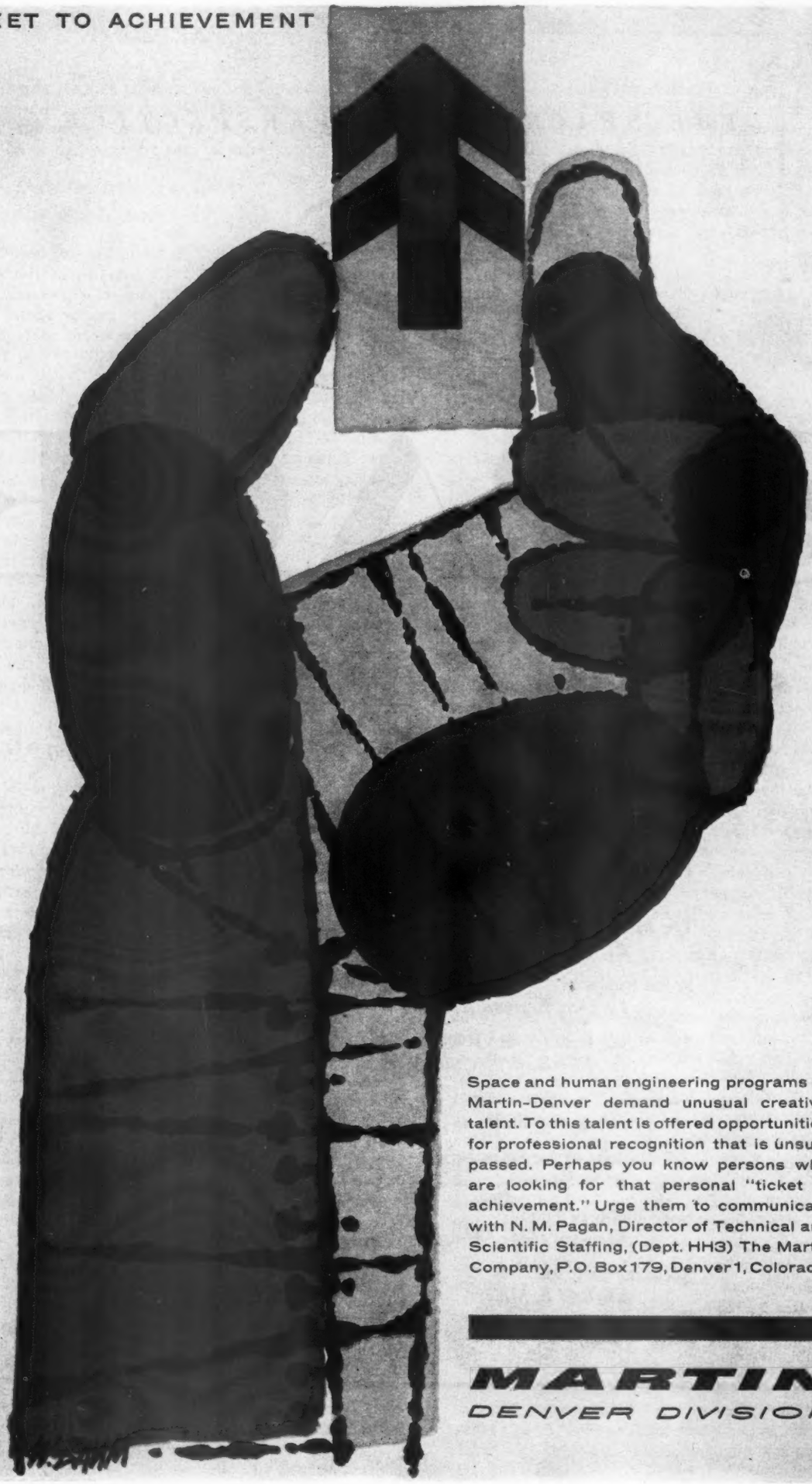
Toward a True Space Age
Dr. Simon Ramo 72

Tribulations of the Scientist
B. N. Petrov 81

Spaceflights of Fancy
Marjorie Hope Nicolson 82

Speaking of Space
Michael B. Miller 86

TICKET TO ACHIEVEMENT



Space and human engineering programs at Martin-Denver demand unusual creative talent. To this talent is offered opportunities for professional recognition that is unsurpassed. Perhaps you know persons who are looking for that personal "ticket to achievement." Urge them to communicate with N. M. Pagan, Director of Technical and Scientific Staffing, (Dept. HH3) The Martin Company, P.O. Box 179, Denver 1, Colorado.

MARTIN
DENVER DIVISION

Martin-designed Circular Space Computers are available FREE to interested persons by writing to the same address.

A serious political debate on national purpose seems in the offing. Decisions and policies emerging from such a debate could do much to spur a more virile US posture . . .

1960 SPACE ELECTION YEAR

WILLIAM LEAVITT
Associate Editor

AS APPLIED science came to democracy's aid in World War II, so applied democracy—politics—may yet come to the rescue of beleaguered American science in the present technological war.

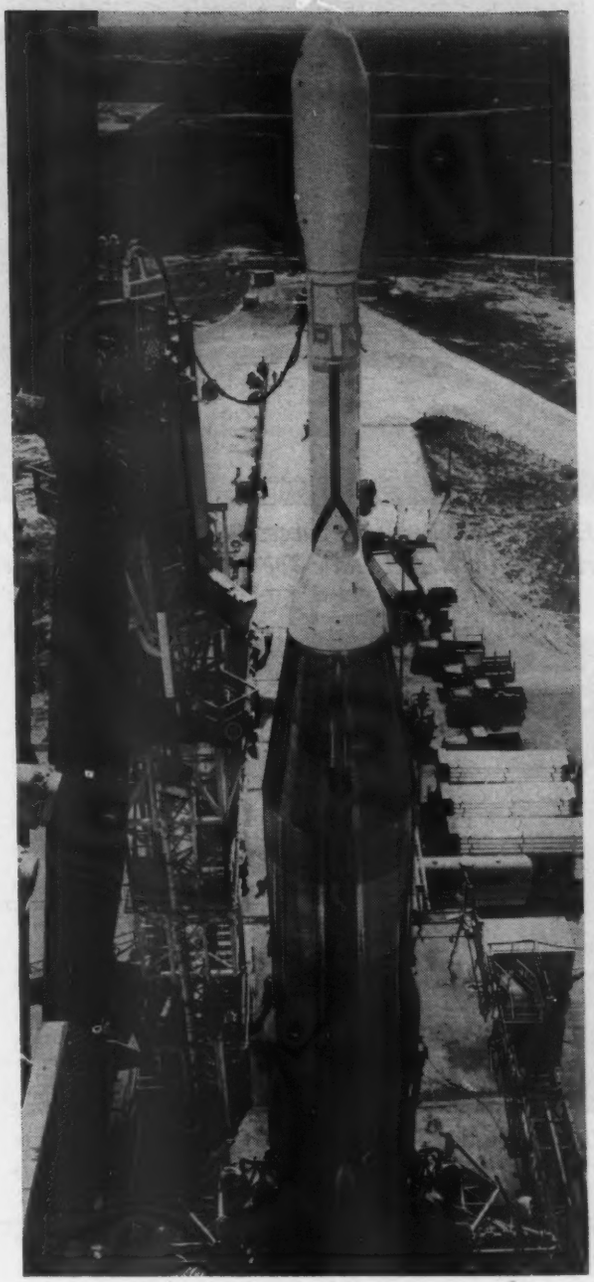
It is almost a certainty that 1960—already assured of significance as a presidential year—will bring new approaches to the nettlesome problem of creating a technological-political program capable of adequately meeting the Soviet challenge.

The recent appointment of USAF Maj. Gen. Don R. Ostrander as National Aeronautics and Space Administration Launch Vehicle Programs Director is apparently an indication of this trend, marking, as it does, an acknowledgment that "civilian" and "military" space programs must be brought more closely together. *(See "Airpower in the News," page 12).*

So far as hardware advances or high-prestige US space experiments are concerned, there is probably little to forecast in the months to come.

Rather the talk in Washington is of delay and stretchout. The Mercury man-in-space mission may wait until 1963, although a manned ballistic flight is possible this or next year. The Saturn million-pound-thrust program is being evaluated, and Vega has been cancelled, its funds diverted to continuing programs.

One happy event was the safe recovery in December of USAF-trained rhesus monkey Sam from a fifty-five-mile-high Mercury escape tower test. That feat sweetened a bit the bitter taste of the Thanksgiving Day moon-shot abort.



Atlas before launch. Tragic failure of Thanksgiving Day moon shot underscores US problems.

But when a situation obtains in which the richest country in the world has no standby vehicle on the pad for such a significant experiment, there is little hope for quick redemption.

As the Washington *Post* remarked editorially on December 8:

". . . The experiment [moon shot] cannot be

Early December saw successful recovery of USAF-trained rhesus monkey, Sam, from 55-mile-high ride atop a NASA Little Joe vehicle. At left, rocket blasts off from Wallops Island; right, Navy rescue.

USS Borie *crew carefully takes Sam aboard ship.*

Safe and sound, Sam, is lifted from "biopack" for examination. He took 19-G stress during his ride.

repeated for a year, however, because there are no more rockets of the same type available. If there were, the same shot presumably could be attempted again in a month and with every hope of success. There is a shortage of Atlas rockets for space research because not enough of them are being produced. Yet the series of successful firings of Atlas ought by now to have resulted in stepped-up production for space purposes. . . .

"We think that another Atlas ought to be diverted for a second attempt. . . . The important need is for the Administration finally to recognize the importance of space research and to admit that this country is not only three to five years behind Russia but has little prospect of closing the gap without a major increase in effort. The admission that the United States must wait another year before even trying to send a major vehicle to the moon seems even more damaging than the failure . . . itself . . . to world regard for this country's technological leadership."

There are a few bright spots. By the time you read this there may be a new NASA Thor-Able vehicle en route to the vicinity of Venus to test long-range radio communications, and there is a definite NASA program, Project Echo, for 1960 to launch balloonlike radio "mirrors" to test passive orbital communications.

But, as suggested, the advances in this presidential year are likely to be political rather than technological.

Unless no one in the country has learned the lesson of Sputnik, there are indications of a long overdue great debate on the subject of national purpose. Our space posture, as the most dramatic

illustration of applied science as an instrument of national policy in an increasingly complex world, will very likely be the keystone of the coming debate. The quality of the debate and its final outcome will have great bearing on the nature of the remainder of this accelerated century.

As 1959 ended, two painful facts were undeniable: (1) that we are unquestionably behind the Russians in demonstrated space technology and could lose the cold war because of our weakened prestige; and (2) that the highest level of our government remains unconvinced of the significance of this situation.

Happily balancing these unpleasant realities are the growing indications of discontent with the *status quo* on the part of Congress, the more vocal scientists, who have had to take the brunt of the abuse in our space lag, segments of the military, and most significantly, the public.

These groups will figure importantly in election year 1960. Their views and demands are bound to have a healthy effect on the campaign.

At present, it seems to be a waiting game. The scientists are feeling their oats in the semi-political area of speechmaking. A case in point was the recent forthright speech by Dr. William Pickering, Director of NASA's Jet Propulsion Laboratory, at the American Rocket Society meeting in Washington.

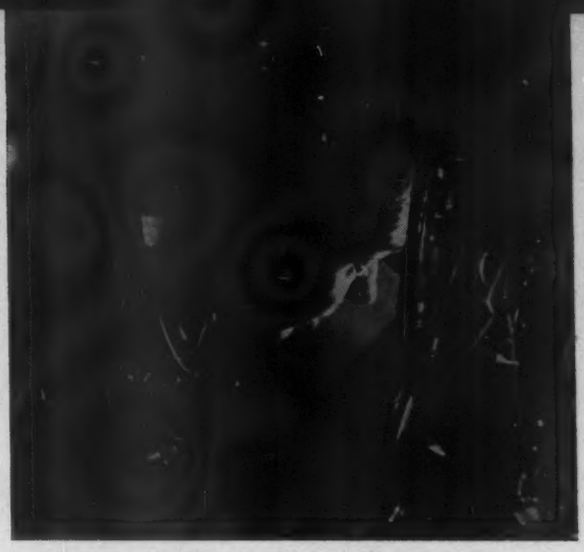
Dr. Pickering demanded that we frankly acknowledge the fact we are in a race with the Russians. Pressed by reporters as to who ought to do the acknowledging, without much hesitation the JPL chief said that was the President's job.

Dr. Pickering stressed, too, his faith that the US public is willing to pay the freight for a purposeful space and science effort. He cited a poll taken recently by a Los Angeles newspaper in which a large number of those interviewed said they would be willing to pay more taxes to finance a stepped-up effort.

Dr. Pickering's remarks were followed a few days later by a speech to the National Press Club in which NASA Administrator T. Keith Glennan told of his agency's having received a check for $100 from a citizen who wanted the money applied to the space effort. Teen-agers don't send in checks for $100.

Mr. Glennan also admitted that we have a lot of catching up to do, although he was loath to pinpoint the President as the man who should be acknowledging the seriousness of the situation, an understandable reticence.

Other speeches and articles on the same general theme have crowded the press in recent weeks.



Balloonist Cmdr. M. D. Ross views Venus from 81,000 feet. He and a companion made the ascent.

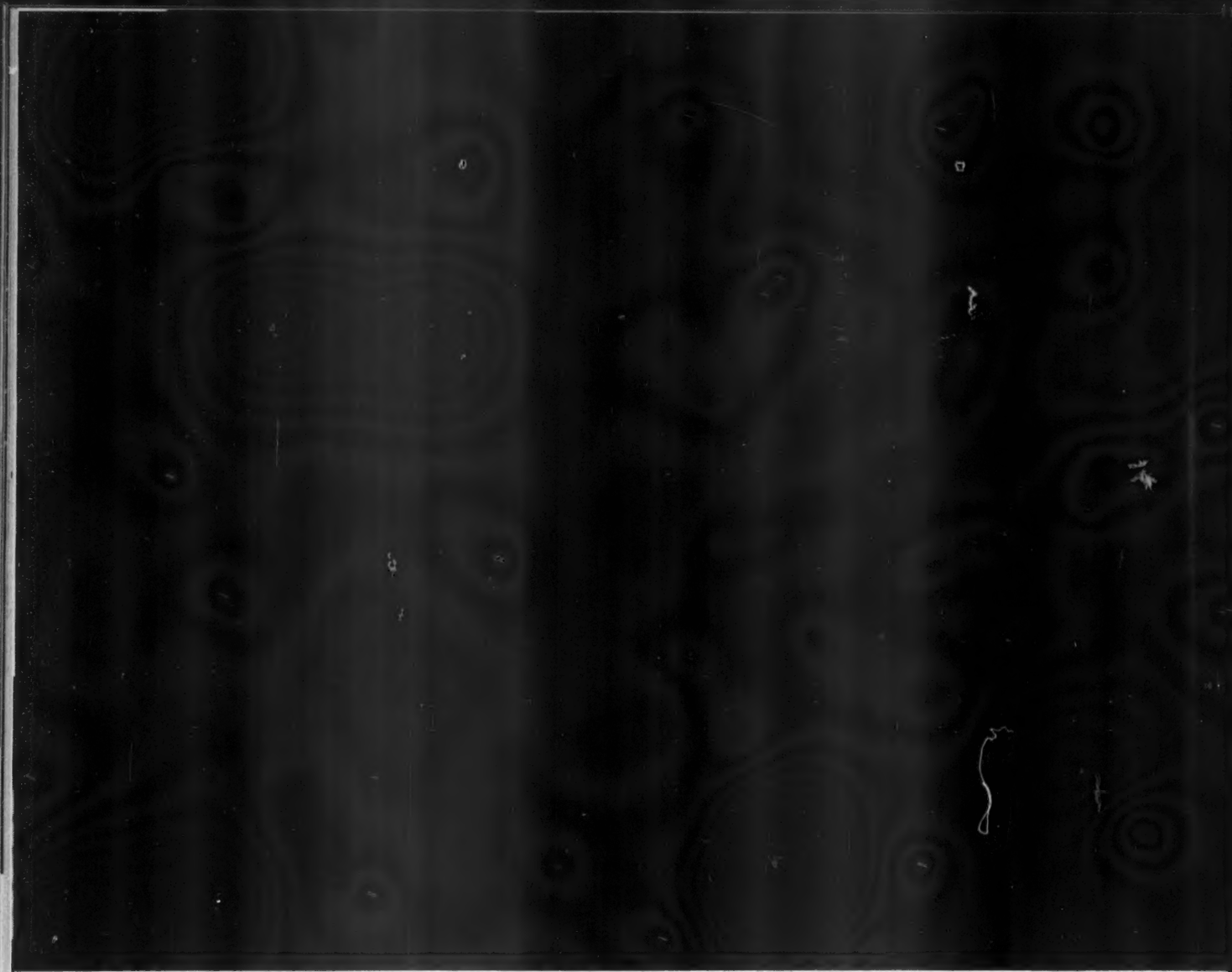
Yet there is a discernible sobriety in the loudened discussion. Although there is general agreement that a stepped-up program is necessary, there is less feeling that such simple "solutions" as management revision will do the trick.

There are still people who honestly feel that a super-agency is the answer, an agency to serve both military and civilian needs in space technology. But there are just as many, in both NASA and the military camps, who are suspicious of that panacea and suggest that what is really needed is a willingness on the highest level to abandon the financial rigidity that forces single approaches to each situation—the kind of thinking that ends up restricting both civilian and military space people so tightly that they have real difficulty working together.

This negatism, reflected in such items as the successive cancellation of the F-108 and the stretchout of the B-70 *(see page 29)*, is exactly the approach that got us into today's situation.

We generally acknowledge the errors of restricting our IGY program to the cheapest possible approach. Are we compounding the error today by restricting our space effort to a low-budget, "pure peace" operation—denying, lest we offend the world—that we, too, intend to have a military capability?

Space, science, goals, national purpose. Heady stuff for an American presidential campaign, but refreshing stuff. There should be plenty of material available for all the candidates; both congressional space committees are sure to reexamine the national space effort. Both political parties will quite probably have "space" planks in their platforms. It is quite possible that 1960 may mark a truly significant turning point in US history—if the debate materializes.—END



A careful examination of available data and a forecast of potentially available information indicate that the feasibility of a self-sustaining lunar-based deterrent force cannot be discounted.

The Military Potential of the Moon

LT. COL. S. E. SINGER, USAF

An increasingly less academic argument in the space age has revolved around use of the moon as ultimate "high ground" for missile retaliation against an aggressor on earth. USAF's Brig. Gen. Homer A. Boushey, Director of Advanced Technology, has been a leading proponent of this idea, while Dr. Lee A. DuBridge, President of the California Institute of Technology, has dismissed lunar-based deterrence as a "Buck Rogers" stunt. The following article explores the pros and cons.

FROM a military point of view, the fundamental basis of deterrence is the capability of launching an overwhelming retaliatory attack regardless of enemy action. One's own force either must be completely safe from attack or must be so constituted that those elements which survive the enemy's first blow are still sufficient to ensure an overwhelming counterblow. . . . The value of lunar bases in a deterrent strategy, then, depends strongly on whether a lunar-based force would be less susceptible to loss by enemy action than one based on earth.

If we envision the moon as sovereign United States territory and deriving from this status all of the perquisites against encroachment that sovereignty implies, then it would be possible to construct lunar missile launch sites that could be made almost completely impregnable. These could be underground sites similar conceptually to current USAF plans for the Minuteman weapon system. It is possible that the topographic features of the moon, its many craters and clefts, would provide a very large number of potential sites requiring little or no additional construction and affording a very large degree of natural concealment and protection.

Under the assumption of sovereignty, such a lunar weapon system would be tremendously "hard" simply because it would be relatively easy to keep it hidden. Direct observation of site locations from the earth, difficult at best, could be avoided completely by locating the launch sites on the far side of the moon, the side that never faces the earth. . . .

As Brig. Gen. Homer A. Boushey, Director of USAF Advanced Technology, points out, lunar missile sites would be very difficult to destroy even if their locations were known to the enemy. Since the moon has no appreciable atmosphere, even a nuclear attack would produce no blast effects. Only radiation effects and ground shock could result from nuclear detonations on the moon. The range of ground shock is very small (on the order of hundreds to a few thousands of feet), and radiation effects are comparatively easy to shield against. Thus the physical destruction of lunar missile sites would be far more difficult than is the case for missile sites on the earth.

The requirement that the moon be a sovereign possession of the United States permits the strongest argument for the hardness of lunar missile sites. But this is clearly the ideal case and not a *sine qua non*. Even should the moon be open to exploration and possible occupation by the USSR, to take the other extreme, the arguments for ease of concealment and intrinsic physical hardness would still apply.

It is all very well for missile sites to be hard, but missiles serve as deterrents only if they can be employed. The concept of threatening the USSR with missiles from the moon may be questioned on the grounds of force size, missile accuracy, and strike time. . . .

It is obviously more difficult to hit a moving target from a moving launch site with a 240,000-mile separation distance than to hit a moving target from a distance of only 5,000 miles. As a function of range, what is required is an improvement in

---

Dr. Singer on Space War

It can be argued that a military doctrine for space is unnecessary because man need not or should not ever wage war in space. . . . Strangely enough it is possible to argue the contrary on essentially moral grounds: Space in general and the moon in particular might be the best possible place to wage war if war must be waged. . . .

Man now does have the ability to wage truly total war. Indeed even if he does desire to limit a war, modern nuclear weapons and the possibility of miscalculation make limitation a doubtful and dangerous concept. This is a dilemma which remains unresolved.

Space warfare as a form of limited warfare is a possible solution to this dilemma, and the moon and its environs are close enough to the prospective combatants to be convenient but far enough from the inhabitants of earth to ensure their safety.

At first blush the use of the moon as a locale for conducting limited war is surely somewhat fantastic. The possible annihilation of mankind in a total nuclear war is also fantastic. Perhaps a fantastic problem requires a fantastic solution.

---

accuracy of about a factor of fifty. In a crude way, this requirement can be compared with the improvement in accuracy and range achieved in the ICBM as compared with the V-2s of late World War II. . . . The fact that this ratio is at least the same order of magnitude as that required for a lunar ballistic missile "proves" nothing, of course. But it does at least provide a basis for asserting the reasonableness of a faith in the possibility of further improvement in what is, after all, an infant technology.

A second answer to the question of lunar-launched missile accuracy, an answer of greater technical sophistication, has been suggested by General Boushey. This is the possibility of launch-to-impact guidance. Because of the earth's rotation, every point on earth except a small portion of the polar regions is directly visible from the moon for at least half of every earth day. Depending upon the relative positions of the earth and the moon, that hemisphere of the earth facing the moon is either in direct sunlight or direct moonlight or some combination of the two at all times except for brief periods of eclipse that do not exceed two hours in duration. It follows that a missile launched from the moon could be more or less directly guided to any earth target, provided allowance were made for proper timing with respect to the earth's rotation. The telescopic, telemetry, guidance, and radar techniques which might be required are now in existence.

It has been argued by Dr. [Lee A.] DuBridge [President of the California Institute of Technology] that this concept is invalid because much of the earth's surface is covered by clouds much of the time. This argument depends on the assumption that a target must be seen to be hit. Two established techniques, radar bombing and bombing by offset aiming points, do not require direct visual observation of the target; hence the assumption is erroneous. There seems to be a better argument: Since an ICBM requires a minimum of one navigational fix in the sense that its launch point is always known with respect to the target, likewise a lunar-launched missile nearing its earth target might require a minimum of one earth fix to permit its final flight path to be established within the accuracy limits now attainable with the ICBM. This fix could be in any part of the earth's hemisphere "visible" to the moon or the missile at the time. Thus the general presence of clouds does not invalidate this concept unless one insists on making the problematical assumption that an entire half of the earth is likely to be completely covered by clouds. And even this assumption is negated

if one envisions a missile equipped with radar sighting devices.

General Boushey, in suggesting the lunar-launched missile concept, asserted that the missile would take about two days to reach its target; Dr. DuBridge assumed a flight time of five days. On the basis of the five-day figure, DuBridge then argues that "the war might be over by then." Obviously a lengthy strike time also implies a warning time which may be undesirable. In point of fact, however, both of these flight-time estimates are too high. . . .

More seriously in question are their implications that flight times from moon to earth will be the same as earth to moon. Because lunar escape velocity is much lower than the earth's, a given amount of fuel for a lunar-launched missile can be employed either to carry a much larger payload than for an earth-to-moon transit or to give a much higher velocity. For this reason all earth-to-moon transit time calculations approximate upper limits for the reverse route. Thus, judging from Juno IV's 1.4 days, not to mention Lunik I's 1.8 days, even current technology is capable of sending a missile from moon to earth in considerably less than two days. . . . It may not be unreasonable to assume that the time can be reduced to minutes if the requirements of deterrence or employment so demand. . . .

It would probably not be unreasonable to assume that any significant exploitation of lunar

potentials might cost tens of billions. . . . However, there is one aspect of dollar costing of lunar exploitation that is easily overlooked and that could affect the cost figures profoundly—energy costing.

It is usually assumed that the moon is so completely barren, so devoid of available resources, that man could exist on the moon only by hauling from the earth all that he requires. Under these circumstances by far the largest fraction of the cost of a lunar program, in an ultimate sense, is the cost of the energy needed to move from the earth to the moon absolutely everything required there. This assumption will certainly be valid for man's initial lunar landings. Oxygen, food, water, shelter, instruments, tools—everything will have to be brought from the earth. . . .

The moon is not nearly so barren as it seems. All the energy man could conceivably use is certainly available on the moon, and most if not all of the chemical elements he requires are probably there as well. If this energy can be stored and used to convert the moon's chemical elements to the chemical compounds and physical forms needed to sustain human life and work, then the energy costing concept becomes tremendously important. It then becomes possible to consider the cost of earth-to-moon hauling as a capital investment that could yield rich profits and therefore could be amortized over a long period of time. In economic terms, a lunar autarky is thus conceivable.

Is this concept technically sound? The energy aspect of the concept can be summarized as follows: Abundant heat energy is available on the surface of the moon in the form of radiation received from the sun. This is heat and light unattenuated by an atmosphere or by clouds. Its intensity and duration are completely predictable, unlike the case on earth. If heat is available, it follows that it can be converted to electricity and other forms of energy by techniques too well known to require elaboration. Moreover the moon provides a unique possibility for the storage of energy, so that the lack of solar radiation during the lunar night need not constitute a problem. This lies in the possibility of using inertial flywheels to store energy. . . . Since the moon has no atmosphere, this very simple technique for storing energy on a large scale would be practical on the moon. . . .

Given energy, the attainment of the means of sustaining life and work on the moon becomes a matter of the availability of the chemical elements basic to all needs and of their conversion to the desired or required physical form. The case for this aspect of lunar autarky is much more complex and less certain than the case for the availability of energy. . . .

Nevertheless, it is possible to make a case for finding a wealth of elements on the moon and for exploiting them. The essence of such a thesis can be outlined: Although we are certain that there are no bodies of water on the moon, there are reasonable grounds for believing that water exists in a trapped form in certain lunar minerals. If this be the case, then both the human and technological requirements for water can be met by distilling it from these minerals. Electrolysis of the water, a very simple process, would then yield both oxygen, to sustain life, and hydrogen, to serve as rocket fuel or raw material for chemical synthesis. With both water and oxygen available, two of the most significant requirements for hydroponic agriculture have been met. Viewed very crudely and briefly, then the elemental and compositional bases to sustain life on the moon are possibly available from its own natural resources.

The argument for the existence and availability of the elements and compounds needed as a basis for a more complex lunar economy is based primarily on our belief that the chemical elements which make up the moon should not be greatly different from those which make up the earth. Thus all the metals and nonmetals, indeed the entire periodic table, are held to have been represented in the moon's composition at some very early time in its history. This much is almost certain. But how these elements combined or failed to combine and how they are now distributed over or near the surface of the moon and which ones might have escaped into space—all these factors are really unknown. If the moon's crust is highly similar to the earth's, which is the scientific consensus at this time, then the availability and exploitation of lunar minerals may well be similar to their availability and exploitation on earth, at least in terms of the technologies and energy expenditures required.—END

Colonel Singer, who holds a Ph.D. in nuclear chemistry, is presently assigned as Physicist, Defense Atomic Support Agency, Washington, D. C. He was Chief, Radiation Branch, Effects Division, Air Force Special Weapons Center, Kirtland AFB, N. M., prior to his present post. The above material is condensed from an article in the Summer '59 issue of Air University Quarterly Review.

Space Realism

LT. GEN. BERNARD A. SCHRIEVER, USAF
Commander, Air Research and Development Command

We cannot afford to set our military services apart from the scientific and industrial community. If we are to gain the lead in space technology, we must marshal all *our resources . . .*

A SCIENTIST explores beyond the boundaries of past experience to enlarge his fund of knowledge. It is a powerful attraction—but not a question of life or death. But the airman, soldier, or sailor, moves forward into the unknown for the salvation of his country—for the safety of his own and his neighbor's family, and their freedom to live as they choose. He investigates new regions—on the earth or in space—because he must exploit them, if he can, before a potential enemy seizes them for a military advantage. This is a built-in incentive to progress of the highest order which is peculiar to the military.

From the dawn of history, exploration has nearly always been a task for military men. The campaigns of Caesar carried Roman civilization into Europe and Britain. The Crusades opened routes for trade with the Orient. Although Columbus was primarily a navigator, soldiers like Cortez and Pizarro introduced Spanish culture to the Americas. The United States cavalry surveyed wagon trails across the plains to our West, and guarded the settlers who followed them. Japan was persuaded to give up its isolation by an American naval expedition. The Army Medical Corps conquered yellow fever in Panama while Army engineers were digging the Panama Canal. The Navy has guided and supported our gradual penetration of the Antarctic, where the problems we encounter are not unlike the ones we find in space.

Traditionally, in our country, we have relied on the organized facilities of the armed services for much more than protection against conquest in war. Improvements in harbors and rivers are entrusted to the Army; the Navy conducts navigational surveys; the Air Force pioneers air routes across the Arctic Circle and other unknown areas. All three services police the uncharted regions where people go in search of knowledge or commerce, and hold themselves ready to offer help in case of trouble.

I believe that space exploration is going to require the same kind of support from the military, increasingly as time goes on. Already our vehicles and launching facilities are used for space experiments. Our pilots are chosen for pioneer flights in space, because military men have the experience and training in arduous assignments that fit them to meet the hardships of a new environment.

Above and beyond all these incidental functions is our responsibility for the security of this nation in the space age. In the time it takes a person—or a missile—to go from one place to another, the world has become an island smaller than Britain in the days of King Arthur. Oceans have shrunk until they are barriers less formidable than the moats around medieval castles. The United States is a province as open to aggression on every side as a duchy in some Central European kingdom of yesterday. Our ability to penetrate the aerospace above us has brought about this change.

We cannot afford to concentrate solely on scientific explorations in space, and ignore its vast extension of the air as a theater of military operations. Our adversaries are not bound by either legal restrictions or moral law limiting their exploration of space to peaceful scientific objectives. It is commonly accepted that their effort is a total one, harnessing their intellectual and productive resources toward one end—the strengthening and extension of communism through the coordinated power of scientific, industrial, economic, political, and military means. Their announced aim is to control any territory within their reach.

For this reason, we cannot afford to set our military services apart from the scientific and industrial community, confining our use of the techniques and facilities which we have developed solely to the refinement of existing weapon systems. Our two great objectives—to increase human knowledge and to defend human freedom—are inseparable. If we are not merely to catch up with the USSR, but to gain the lead ourselves—at the earliest possible moment—we must marshal all our resources to the fullest, in a concerted drive to master the challenge of space.—END

From an address to the Aero Club of Washington, D. C., November 24, 1959.

The Russian space leap is already measurable in cold cash benefits. Either we enter the race in earnest or candidly forfeit the winnings and concentrate on something else, says a distinguished scientist at one of our leading laboratories . . .

The Stakes in the Space Race

DR. EBERHARDT RECHTIN

THE PRIZES which the Russians have picked up in these early laps of the space race are worth looking at in a little detail. Some can be valued in cold cash. The Russians probably spent on the order of $500 million in order to launch the first several Sputniks. As a direct result of these launchings, Russian technical prestige took a large discrete jump upward in the world market. Making a highly conservative guess of the cash value of this jump, based upon the size of the world market and the size of various governmental expenditures, the first several Sputniks meant a return on the world market on the order of $5 billion. By spending $500 million the Russians got back about ten times that amount.

To illustrate the economic effect: Suppose that you were a civil servant in South America or in Asia and you were responsible for choosing a contractor to build a bridge. Because your own country has no bridge-building contractors, you must look to other countries of the world. First, consider the case when you were trying to decide on this contractor in about 1954. You would probably have considered obtaining your bridge from the United States, the United Kingdom, or perhaps, West Germany. It is unlikely that you would have considered a Russian contractor too seriously. Let's change the date to 1958. The countries which immediately come to mind are now Russia and the United States.

Another prize, very easily overlooked by us, is an advantage which is probably of even greater value—such achievements are an enormous boost to nationalism and patriotism, and the Communists have succeeded in adding this asset of patriotism to support for communism. The fact that the Communist government is now in far better standing with the Russian people is evidenced by at least two facts, that the absolute dictator of Russia could afford to be out of his country for a period of three months, and secondly, that we no longer hear that "if we could only reach the Russian people directly, they would overthrow the Communist yoke." Such talk no longer seems quite realistic.

The Sputniks also greatly changed the world picture of the average Russian. The massive, violent, and not too intelligent Russian bear is no

longer a very good description of the country that can launch space vehicles. It would have to be a pretty intelligent bear to take pictures of the far side of the moon. This reevaluation of the Russians has also shown up in such things as very well attended classes in Russian at the Jet Propulsion Laboratory. The attendees recognize that it is going to be quite worthwhile to be able to listen to what the Russians say *in Russian*. Not too many years ago, the attendees would have been investigated by Senator McCarthy.

Add to the list of prizes: The Russians have managed to demonstrate to the world the detailed characteristics of their ICBM technology in a way which is perhaps even more effective than going to war. Not too many years ago, there was a question whether the Russians had any rockets at all. Then the question changed to whether they had very much thrust to their rockets. Until very recently there was then the question of whether or not, given a large thrust, the Russians could hit anything with their rockets. The only remaining question, now, is whether the Russians can recover a device from a long ballistic flight outside the atmosphere. It is reasonable to expect that demonstration within about three months.

It is probably no coincidence that the Russians began mentioning (and we began considering) coequal summit meetings just after the launchings of the Sputniks. It is now no longer Russia, Great Britain, and the United States as the three great powers. It is now Russia versus the West, even up. That particular advantage Mr. Khrushchev probably appreciated very quickly after the first Sputniks. However, there was another prize which he evidently did not see (or choose to exploit) until very recently. This prize was the direct association of the space successes with "the results of forty years of Communist society" as a compelling argument in the Communistic conversion campaigns. We often disposed of the earlier claims of the Communists that their political society was better than our political society by a simple comparison of our standards of living.

Now, however, Mr. Khrushchev has made it quite clear that he wishes to compare not present status but rather rate of progress when considering the two societies. The Soviets have recently added another element to this particular line by announcing that they were now going to make loans on the world market quite comparable to those made by the United States but with the exception that there would be fewer visible strings. We can expect to hear of the remarkable achievement of the Communists in evidencing such a complete recovery of a country by its own efforts within fifteen years of an obliterating war.

The real surprise is that the *expected* prize of all this space activity was supposed to be science and discovery and yet this prize seems to come last on the list. Until very recently, the Russians had not made any astonishing scientific discoveries, and it almost appeared as if the United States held the monopoly. Unfortunately, that US monopoly no longer exists, and the Russians have made scientific discoveries which are recognized as such throughout the world. The Russians have told us that the moon has no magnetic field nor does it have any Van Allen radiation belt. It is unlikely that anyone will question this discovery.

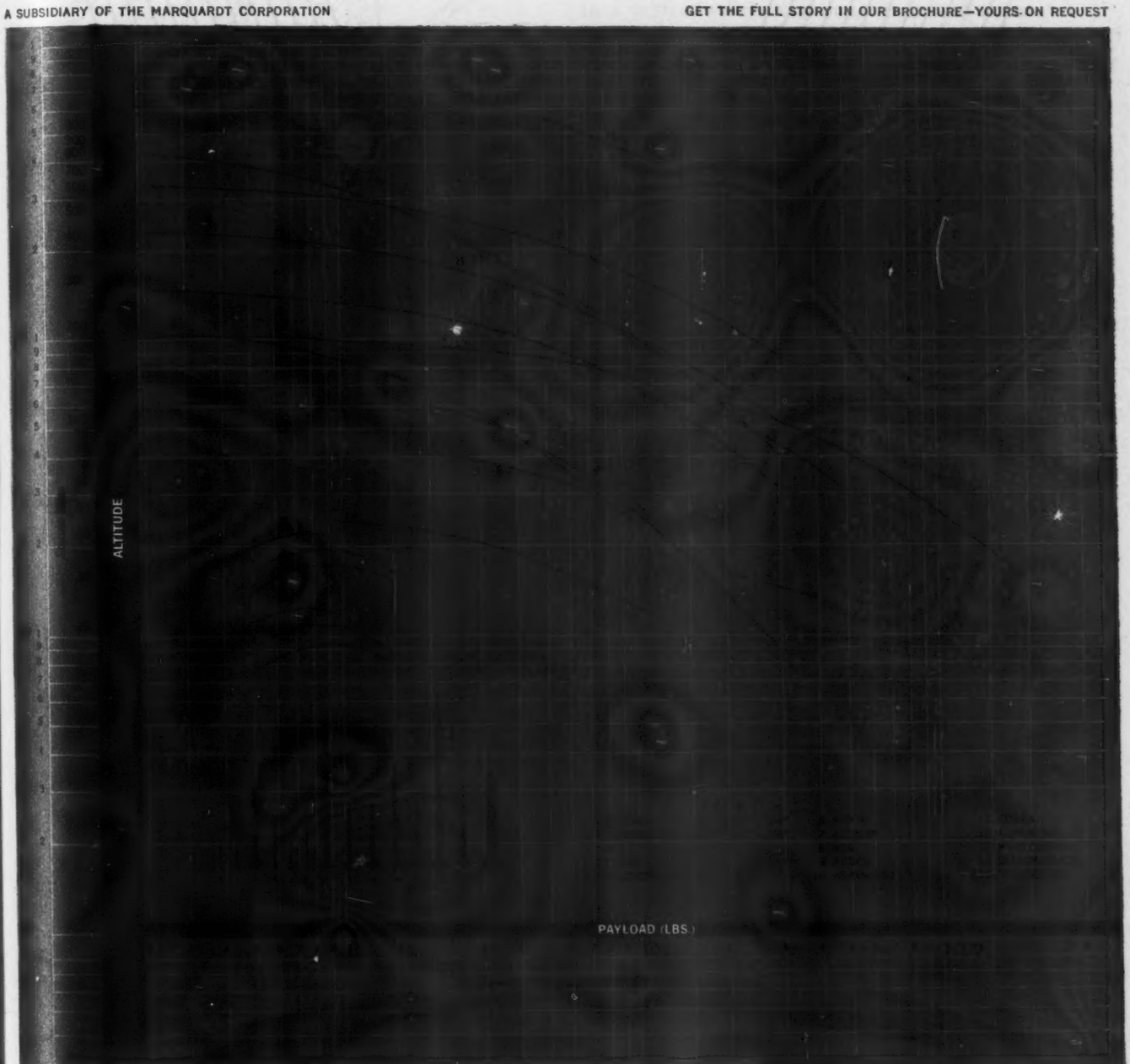
The Russians will most certainly continue in the space race since it very well meets the over-all objectives of Communist society. The race, to them, is economically, politically, and psychologically a sound program to direct against the principal competitor, the United States. The Russians have succeeded in putting us in the position of "acute embarrassment" which they can certainly exploit ruthlessly. In the long run, the Russians probably realize, as we do, that exploration has always paid for itself, if you have the time to wait for the final returns.

From the economic standpoint, it can be shown that certain types of space vehicles will more than pay for themselves. Both communication and weather satellites can be used to make money. The Russians, could, for example, set up a worldwide communication system which would be considerably better and more reliable than our high-frequency radio system in use today. The Russians could then rent and control this communication system.

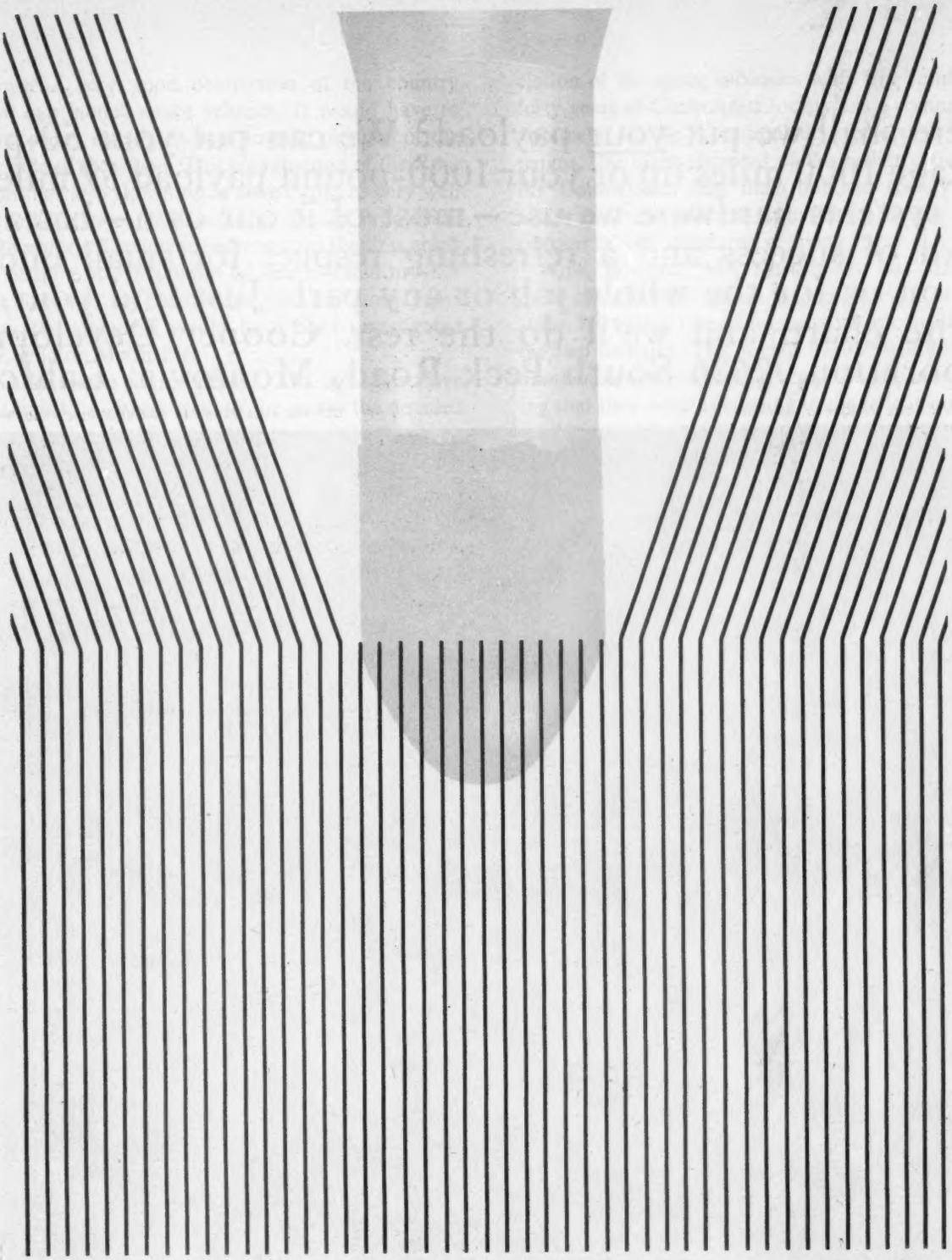
Where shall we put <u>your</u> payload? We can put your 50-pound package 1000 miles up or your 1000-pound payload 57 miles up. The systems hardware we use—most of it our own—has a long record of success and a refreshing respect for small budgets. Call on us for the whole job or any part. Just find your need on the chart, and we'll do the rest. Cooper Development Corporation, 2626 South Peck Road, Monrovia, California.

A SUBSIDIARY OF THE MARQUARDT CORPORATION

GET THE FULL STORY IN OUR BROCHURE—YOURS ON REQUEST



SCIENTISTS, CREATIVE ENGINEERS—INVESTIGATE THIS FIELD WITH A FUTURE. CHALLENGING WORKING ENVIRONMENT IN SOUTHERN CALIFORNIA



Avco cools a nose cone—at 12,000°F. — To bring a space vehicle safely through the 12,000-degree heat of atmospheric re-entry, Avco scientists have developed radically new "space age materials." One of these, a ceramic structure termed Avcoite, made history as it returned this country's first successfully recovered ICBM nose cone. Today, materials research at Avco continues in new and bold directions, ranging from heat-resistant rocket nozzles to light-weight space structures.

Avco

AVCO MAKES THINGS BETTER FOR AMERICA / AVCO CORPORATION / 750 THIRD AVENUE, NEW YORK 17, N. Y.

Fortunately, or otherwise, as you prefer, the United States at the moment is neither in nor out of the space race. We have made no declaration to accept the Russian challenge. We have no programs whose avowed intent is to close the gap between ourselves and the Russians. We have one or two programs whose hopeful intent is to try to keep the gap from getting wider. At present, one of the most remarkable features of the US position is the almost complete lack of urgency in the space program. This lack of urgency is justified, presumably, by a statement that we are in a scientific program and not a race. I have not yet figured out why coming in second in science is any different or better than coming in second anywhere else. The remaining indication that we are neither in nor out of the space race is the present funding level. The National Aeronautics and Space Administration budget is now somewhat less than what the United States pays to ship and store surplus wheat. Our space program is less than two percent of our defense budget. The space program costs less than ten dollars per year per US adult or roughly one evening's entertainment per year.

On the other hand, we have not declared ourselves *out,* either, and unless we do, the rest of the world probably assumes we are in. The results of continuing at our present level are not particularly encouraging. In the last two years we have dropped six months to a year farther behind in the process of organizing, reevaluating, carving out paper empires, and fighting over who is going to be the boss to tell the professional what to do.

The results of continuing as we are were illustrated the other day in a meeting at JPL in which we were attempting to plan the missions for a set of space vehicles in 1961 and 1962. We went through the process of setting up a logical and technically sound program, only to be shocked at the end of our efforts to find that the first half of our fine program had already been done by the Russians.

Continuing at the present level is largely a waste of money. At the moment, we are paying for the privilege of being the perfect straight man for the Russians. As Mr. Glennan has stated, "We cannot run second very long and still talk of leadership."

In a perfectly objective way, we should therefore consider the results of declaring ourselves out of this game. We might well save ourselves a great deal of embarrassment. We would have to yield the field to the Russians and admit that they are highly successful. What would hurt is that we would have to admit by inference that their reason for success, namely the Communist society, might also be true. If we declared ourselves out of the race, we would definitely need a different race as a substitute. This other race must have drama and interest and must have exportable advantages. Unfortunately, neither our standard of living nor our foreign aid can be used as a satisfactory substitute. The statement that "we went military" is not a particularly good counterargument to the Russians' space activity. On the other hand, we would at least quit being the straight man, quit wasting our money, and stop some of the endless frustrations.

We should also consider the results of declaring ourselves *in* the space race. It will certainly cost us more money than we are presently spending. We should probably spend the amount of money which Dr. Killian initially estimated, about $1.5 billion per year, or approximately something less than five percent of our defense budget. We are going to need clearly defined goals, specifically, whether or not we intend to accept the Russian challenge. We will need facilities and priorities. We need a very hard-boiled look at the past performance of groups in the United States and a willingness to let the finally chosen professionals run their own race.—END

Dr. Rechtin, Chief of the Guidance and Research Division of the Jet Propulsion Laboratory of the California Institute of Technology, is affiliated with the National Aeronautics and Space Administration. The above material is condensed from his recent speech to the Electric Club in Los Angeles.

PICTURE A SITUATION IN WHICH AN ENEMY NATION ALONE MASTERS SPACE PHENOMENA AND IN AN ANNOUNCED DEMONSTRATION CONFRONTS US WITH THE ALARMING SUGGESTION THAT THEY COULD REMOVE THE UNITED STATES FROM EXISTENCE IF THEY CHOSE TO DO SO . . .

Toward a TRUE Space Age

DR. SIMON RAMO

WE CANNOT be certain exactly how the moon and all of outer space may eventually be used until and unless we seriously investigate. Suppose we were to discover, for example, that there exists some mysterious new kind of radiation from outer space that under ordinary circumstances fails to penetrate our atmosphere, or, if it does so, is much diffused and has no noticeable effect on our well-being. We further suppose that this radiation passes through certain favored regions in outer space, and that at these concentrated places we can place matter to focus and control the radiation.

Picture, then, a situation in which an enemy nation alone masters these phenomena and then in an announced demonstration burns up an area on the moon in a split second. They then confront us with the alarming suggestion that they could remove the US from existence if they chose.

I must emphasize that we do not know of any such new and peculiar radiation, and we have no reason to expect it to be discovered. But perhaps there do exist other undiscovered phenomena in nature making possible new forms of warfare which might be uncovered by research in outer space.

We can generalize further: All space apparatus has potential military value, even if only for scientific data-gathering, because these data may strengthen the nation that collects them. Accordingly, to some it would appear that each nation must be prepared to seek out and destroy space vehicles of its potential enemy—this, even if it means sending up a more costly space follower to be paired off with each rival entry into space. Of course, this game readily leads to more and more complex weapons encompassing more and more of outer space. The problems of detection, communications, interception, decision-making—these represent a new scale of warfare. There is no end to the outer space used by that kind of cold-war world. . . .

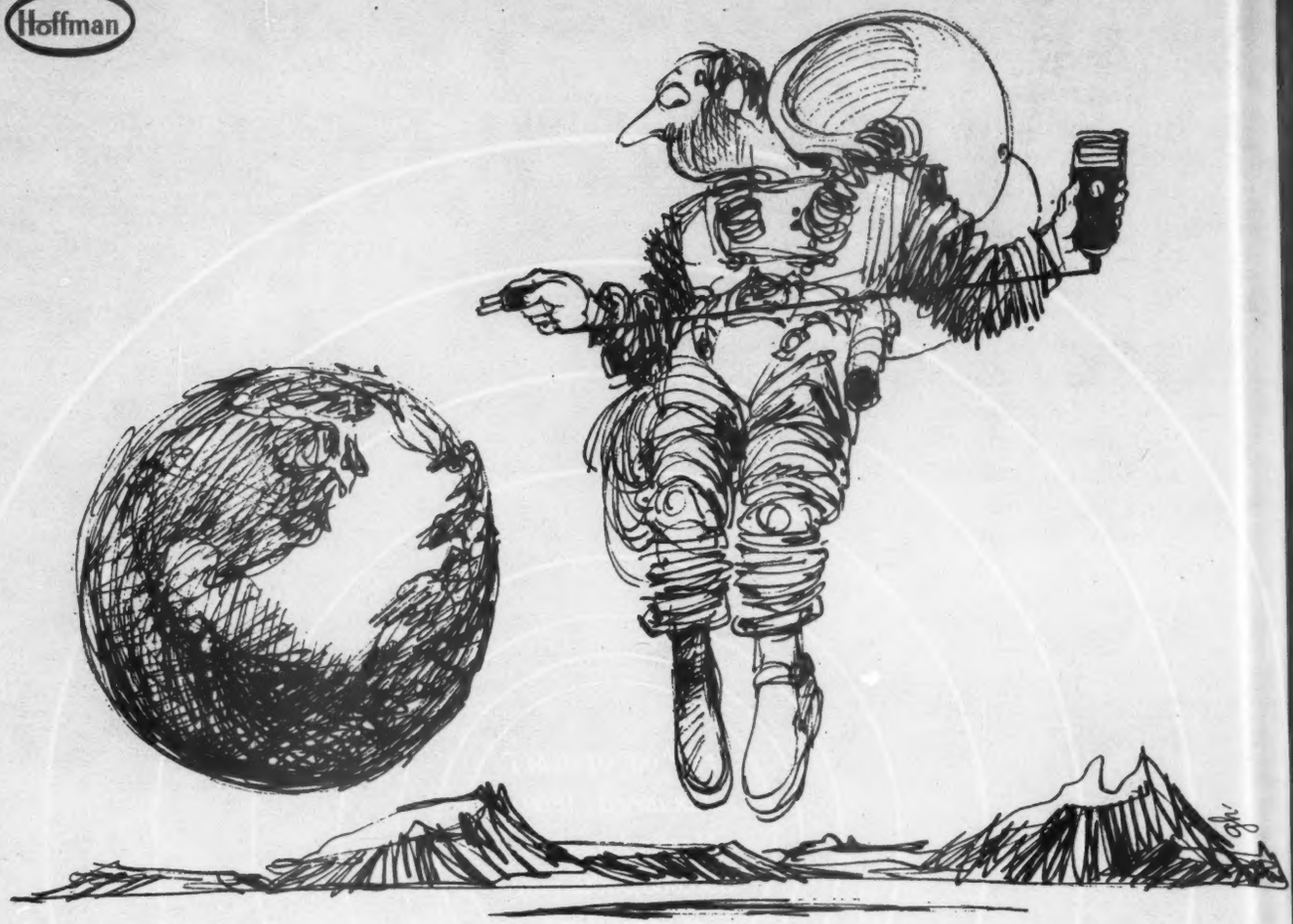
Let us now leave the strictly military use of space to ask next about its use for peacetime applications to improve our standard of living. We should take quick advantage of our new ability to put equipment in space to attain better world communications, navigation, and weather prediction. All of these improvements are possible, and they will come in the next decade. However, we should not let our excitement over everything with a space label cause us to miss the point that these developments are natural extensions of our surface civilization. The placing of relay equipment on a satellite for worldwide TV hookups or broader intercontinental telephony, as compared with doing the same jobs by more oceanic cables, is just a better engineering alternative, not a whole new way of life made possible by space.

Weather prediction and control will come only after major advances in meteorology, electronics, and the basic physics of energy control. A weather-control system would include measurement apparatus at thousands of points over the earth's surface and at numerous altitudes above it—including a few observation points in distant space—with a myriad of computing, communication, and control equipment on earth, not to mention some rather spectacular, but as yet uninvented, formulas for predicting how much matter and energy should be put where, so as to do something about the weather.

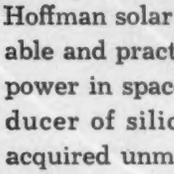
eaders in Missiles / Space Technology—
OOSTER SYSTEMS, ELECTRONICS, GROUND SUPPORT EQUIPMENT, AND NUCLEONICS.

MARTIN

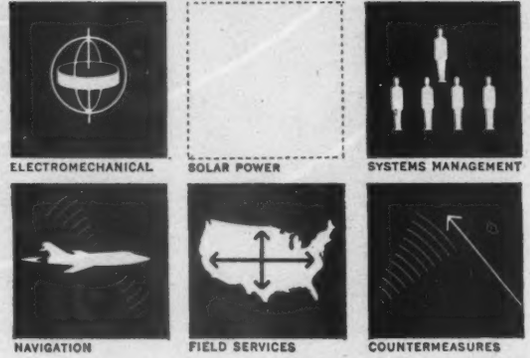
Hoffman



space power problems?



When you're 250,000 miles from conventional power sources, you don't have to depend on limited-life batteries to supply electricity. Hoffman solar energy converters offer a reliable and practical solution to the problem of power in space. As the nation's leading producer of silicon solar cells, Hoffman has acquired unmatched experience in this field and is furthering the study of space power problems through its Advanced Development Section. Already tested and proved in U. S. space probes and satellites, Hoffman solar cells can solve your space power problems.



Hoffman / ELECTRONICS CORPORATION

Hoffman Laboratories Division

3740 S. Grand Avenue, Los Angeles 7, California

Significant developments at Hoffman have created positions for scientists and engineers of high calibre. Please address inquiries to Vice President, Engineering.

Such possibilities obviously deserve investigation. However . . . space projects for improving our standard of living should be expected to stand in line and face the same careful, competitive, common-sense scrutiny as the equally urgently needed airline navigation and traffic-control system or, perhaps, peaceful nuclear power—and maybe all such projects should stand behind better schooling in the line-up.

Let us now discuss the trips to Venus and Mars. Here, clearly, the problem is not one of immediate, vital military security but one of exploration of the unknown. We do not do enough pure research. What passes under this title is usually exploitation of existing science, like stereosound, a new house paint, or power steering. Note that we first had to have our national prestige challenged by a conspicuous Soviet achievement before developing a well financed program to learn more about the universe through space probings.

Scientific research has always offered to improve man's lot on earth. Yet, our national habit has been to assign an almost trivial amount of our resources to back research and to help universities so they can increase our abilities. Trips to other planets are expensive; the cost would cover a lot of cancer research. It is difficult to prove that space probing will do more for us than a similarly concerted effort in biology and medicine. Even if psychological warfare with science is here to stay, it is not obvious that a space success will buy us more prestige than an advance in curing disease. But the space race is on. Perhaps we had better hurriedly build a good research program in this field while the sponsorship can be had, and hope the habit of strong research support will be acquired.

The ultimate in long-range space research is to make possible man's visitation to neighboring planets, and maybe some day even to other solar systems. Of course, we have yet before us the first experiments with man in near space. The first nation to put a man in space wins only a psychological, not a military advantage. However, we cannot with confident accuracy predict the future "man-machines" teamwork that the military might need in space. It is too risky to allow some other nation to have full flexibility in designing the best military system while we decide ahead of time that man's observation and thinking ability in space are of no value. So, we will have man in near space soon. . . .

What, now, of eventual possibilities of man's becoming a true space dweller or reaching some other solar system? Radical propulsion methods are under development making possible velocities far exceeding that for escape from the earth and our sun but still very much smaller than the velocity of light. Since the nearest star is some light-years away, this means that the time it would take to get there is still far in excess of man's lifetime. Of course, we may eventually discover new physical phenomena that will make possible travel near the velocity of light. When this happens, then man could visit the environment of the nearest star in an endurably short period of travel. . . .

If we do not discover a new physical process to make possible such high velocities, there is still another approach to the problem. Nothing in today's science limits the size of the vehicle that can be launched. It may take a few hundred years to reach the nearest star, but if the spaceship is large enough it can carry an entire community—men, women, justices of the peace, and obstetricians. Eventually, we should be able to take off with the proper supply of matter and should be able to continually process and transfer matter and energy into a form suitable for food and oxygen for limitless permanent generations of life away from earth.

This discussion suggests that we are not too likely to find ourselves with a new civilization in outer space without fundamental scientific discoveries. It is not to be expected that these breakthroughs will come by just trying to extend the techniques we now understand. . . .

We have seen something of the scope of space projects alone. This, of course, is dwarfed by the potential magnitude of the impact of all science on our civilization. To ensure our position as a nation, we must develop the greatest possible wisdom in the choice of what we do with our limited technical and physical resources. For one thing, we cannot allow the Soviet Union to determine our course. Because they do something conspicuous first does not mean we must drop everything and rush out to be certain of passing them in that pursuit.

Our most urgent short-range need, of course, is to be wise as we choose what to do with science to assure survival. But, of course, we want to assure as well the long-range survival of civilization. For this goal, we had better appreciate how severe the impact of technological change is really going to be. We are making a transition to a new age. We are now reaching such a large earth population . . . that it is no wonder some of us predict or fear that man is threatened with the destruction of his civilization or with chaos because the

whole seems ever more powerful and rapid than he can learn how to handle.

I choose to be optimistic that we will not fail to make the transition to this new technical age; we will not have chaos or destruction of civilization. . . .

The purely physical or material operations of the technical age—production, transportation, communications—will be at such an increased rate compared with today that the containing and governing of these operations will require major breakthroughs in means of control. New conceptions are needed to assure order in this mammoth wave of things to keep track of. . . .

In short, man's brains and senses must and will be extended, sometimes replaced, with human intelligence elevated to a higher level of contribution. The everyday, mundane, purely material activities of the world must be carried out with a minimum intervention by man. We are truly heading for the automatic society. The future society will be one of better match between man and machines in the use of intelligence. To bring this about, synthetic intelligence will be mass-produced. In other words, what the world will have, and perhaps most needs today, is a good, cheap electronic brain. . . .

If we are to indulge in any optimism at all on the future position of our nation in the year 2000, then education to improve our human brainpower must reach the top position of priority. The educating of our human brains is an example of an intellectual activity. In the world of the future, every intellectual activity will have been studied and redone so it can be performed by the best possible partnership of human brains and senses and machines. This will happen even in education, where the process of teaching our young people and training our specialists will be done by radically new methods in which the human participant in the teaching process will be elevated, and the unique machine called the human brain, relieved of those jobs better done by synthetic machines, will rise to new heights of attainment.

To a great extent our problems today are associated with making the transition to the future highly technical age. We are aware of many bottlenecks in making this transition. Let me mention one I submit to be the most severe constraint to progress today. This can be done best by example.

Consider again the possibility of weather prediction and control. Clearly, the creation of means to improve the weather on this earth could have the most major consequences. Doubling the useful area of the earth, and making that which is already useful much more productive, can set back for a hundred years the problem of population increase. The ability to control weather is dependent on breakthroughs in many phases of science. It is less obvious, but equally certain, however, that it will also mean the creation of a truly enormous international engineering project organization.

Now, can you imagine such a project being arranged for in our present world situation?

Is weather to be controlled in the interests of the farmer?

Is it mainly to assure better, more certain air transportation?

If the goal is international, is it for the purpose of improving the lot of nations whose resources would improve with a change in weather?

Who will control and set the goals?

Even for a project in the US alone, it would involve at least a dozen major agencies. The problem would become so highly political, so competitive amongst industries, between industry and government, amongst government agencies, that we could discuss it for many, many years, with relatively ineffective projects—while allowing other nations the opportunity to do the "arrangement-making" for the world.

"Arrangement-making"—making decisions, creating organization, setting policies, implementing major programs, effecting compromises—is today, I think, our most severe national bottleneck and one that will become worse in the future. It is only one of them. The most narrow constriction in the bottle's neck may soon be the shortage of scientists and engineers, or just the shortage of educated and wise people, or the failure to give serious attention to the over-all problem of exploiting science and technology, the tendency to think alone in terms of short-range solutions.

We have far to go to be on top of all of these problems, but the first step is to understand that the problems exist, to take them seriously.—END

Dr. Ramo is executive vice president of Thompson Ramo Wooldridge Inc., one of the important new companies founded since World War II to meet the challenges of the missile and space ages. A physicist with a distinguished record in research, he was born in Utah. This article is condensed from the Steinmetz Memorial Lecture he presented in Schenectady, N. Y., in June.

A TALENT FOR COMMAND CONTROL SYSTEMS

TIME . . . vital element in our nation's defense.

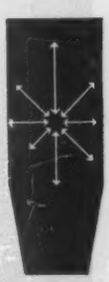
Response to attack must be immediate. The higher speed and greater range of more lethal weapons demand that Commanders of future military systems have a new degree of control that only electronics can provide.

Before the command decision is possible, a mass of information must be gathered from far-flung defense elements, correlated, and presented to the Commander and his staff in readily understandable form . . . this is the function of the Command Control System.

The speed and efficiency of this system must be such that it shall never have to be used of necessity.

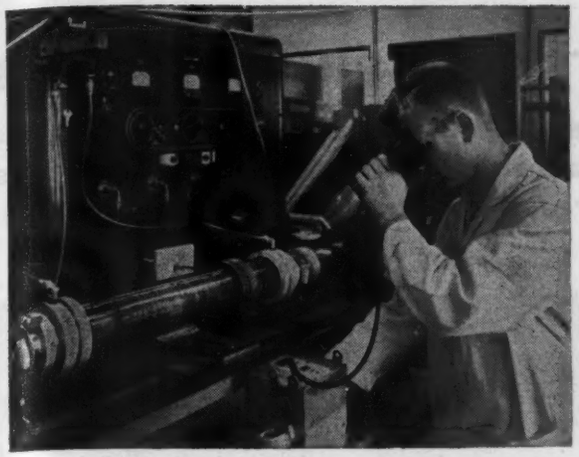
Stromberg-Carlson advanced developments in electronic transmission, processing and display of intelligence . . . the nucleus of a proven talent for Command Control Systems.

Brochure on request.



STROMBERG-CARLSON
A DIVISION OF **GENERAL DYNAMICS**
1400 NORTH GOODMAN STREET • ROCHESTER 3, N. Y.

Checking Einstein with



PURITY PLUS—Hughes Products Division engineer checks semiconductor materials to insure purity.

EXIT CONES capable of withstanding temperatures of 6000°F. represent one example of advanced engineering being performed by the Hughes Plastics Laboratory.

an atomic clock in orbit

To test Einstein's general theory of relativity, scientists at the Hughes research laboratories are developing a thirty pound atomic maser clock (see photo at left) under contract to the National Aeronautics and Space Administration. Orbiting in a satellite, a master clock will be compared with another on the ground to check Einstein's proposition that time flows faster as gravitational pull decreases.

Working from the new research center in Malibu, California, Hughes engineers will develop a MASER (Microwave Amplification through Stimulated Emission of Radiation) clock so accurate that it will neither gain nor lose a single second in 1000 years. This clock, one of three types contracted for by NASA, will measure time directly from the vibrations of the atoms in ammonia molecules.

Before launching, this atomic clock will be synchronized with another on the ground. Each clock will generate a highly stable current with a frequency of billions of cycles per second. Electronic circuitry reduces the rapid oscillations to a slower rate in order to make precise laboratory measurements. The time "ticks" from the orbiting clock will then be transmitted by radio to compare with the time of the clock on earth. By measuring the difference, scientists will be able to check Einstein's theories.

Research like this, brought to practical fruition, has resulted in dozens of important electronic systems for our Armed Forces including: the highly reliable Falcon air-to-air guided missile; the world's first three-dimensional scanning radar; advanced airborne control systems; advanced data handling and display systems; global and spatial communications systems and ballistic missile systems.

Throughout the entire Hughes organization, special emphasis is placed on building reliability into every system...assuring maximum utilization even under the most severe operating conditions.

Hughes' continuing studies in attaining maximum efficiency in manufacturing electronic products and systems have made it one of the industry's lowest cost producers.

Advanced concepts, reliable hardware, low costs gained through greater efficiency...these are the factors which have made Hughes one of the world's leaders in electronics.

Creating a new world with ELECTRONICS

HUGHES

© 1959, HUGHES AIRCRAFT COMPANY

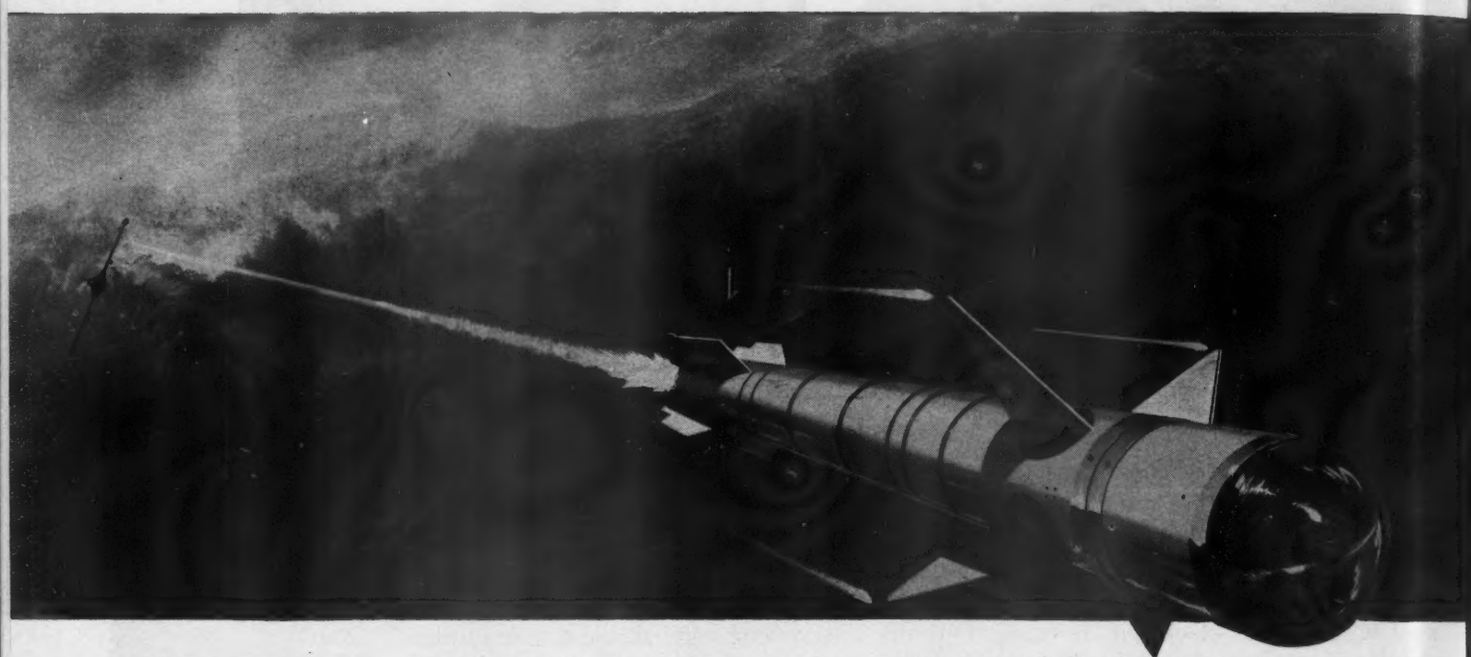
HUGHES AIRCRAFT COMPANY
Culver City, Fullerton, Newport Beach,
El Segundo, Malibu, Oceanside,
Santa Barbara and Los Angeles, California
Tucson, Arizona

PHILCO HAS THE CAPACITY...

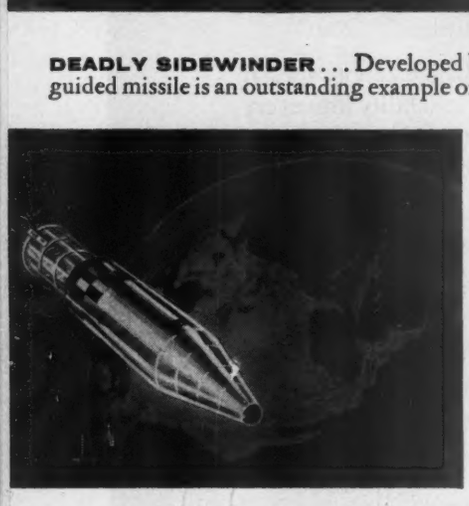
the people, the capabilities, the facilities, to conduct the research and development, engineering, design and manufacturing

FOR MANY AND VARIED ELECTRONIC PRODUCTS AND SYSTEMS

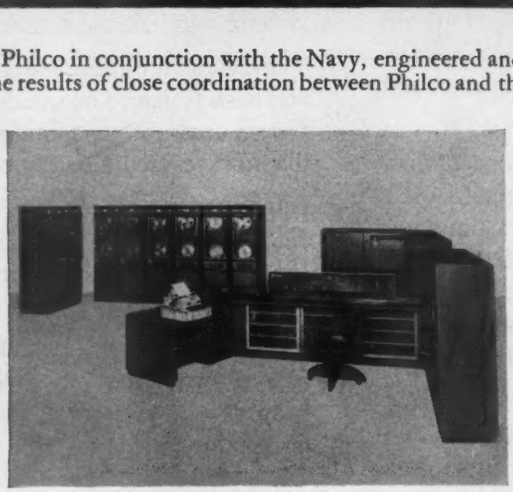
including weapons systems, satellites, space instrumentation, guided missiles, global communications, radar, data links, fire control systems, underwater ordnance, air traffic control, data processing systems and closed-circuit TV.



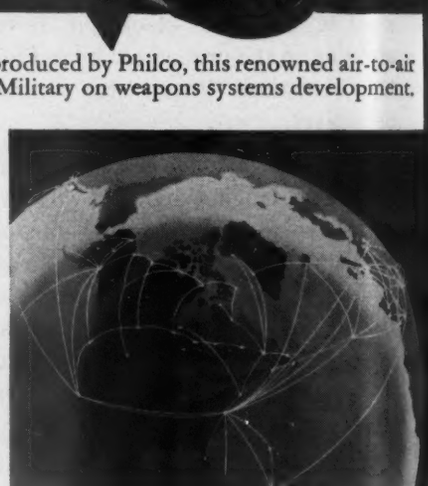
DEADLY SIDEWINDER . . . Developed by Philco in conjunction with the Navy, engineered and produced by Philco, this renowned air-to-air guided missile is an outstanding example of the results of close coordination between Philco and the Military on weapons systems development.



SATELLITE COMMAND AND TRACKING. . . As sub-contractor for Discoverer's entire communications system, Philco designed and developed the vast complexity of ground-space communications, commanding, tracking, data gathering and processing system.



DATA PROCESSING . . . Recognized as the world's first and finest all-transistor, large-scale data processing system, the Philco-2000 truly represents a new horizon in the state of the art. The Philco-2000 is the *only asynchronous computer* commercially available. This means faster computing and freedom from obsolescence.



WORLD'S LARGEST COMMUNICATIONS SYSTEM . . . Under contract with the U. S. Air Force, Philco will modernize and expand Aircom, for phase "Quick Fix". This vast global network will utilize advanced techniques in point-to-point and air-to-ground communications.

Philco Corporation/Government and Industrial Group/Philadelphia 44, Pennsylvania

Communications and Weapons Systems Division • Computer Division • Sierra Electronic Division • Western Development Laboratories

PHILCO®

Famous for Quality the World Over

MEETINGS, MEETINGS, MEETINGS . . .

Tribulations of the Scientist

B. N. PETROV

Corresponding Member, USSR Academy of Sciences

That even the Russians get bogged down in a welter of talk, while scientific work is slowed, is indicated by this plaint, condensed from a recent article in Literaturnaya Gazeta (Literary Gazette), *a well known publication in the Soviet Union.*—THE EDITORS

THE concept of labor productivity is not applicable to the work of the scientist. The production of the scientist is his ideas and theories, discoveries and inventions, methods of calculation and principles of design. Efficiency of scientific work, while not a direct function of time spent, can and must be decisively improved by regulating work conditions and by rationalizing work methods. This has become an important national problem.

Freeing the scientist to give him maximum time for his creative research is the primary means of improving the efficiency of his work. This is possible if organizational activities of all kinds, additional loads, etc., are decreased.

This is not to underestimate or deny the varied jobs of the scientist. It is understood that no highly qualified scientist can be completely freed from scientific organizational and consultant work.

All important scientific problems are solved in our century not by single scientists but by the effort of scientific collectives. This necessitates discussion of scientific problems, checking and criticism during sessions, seminars, and technical councils. However, the success of combined effort is possible only if the director himself is in the avant-garde of the collective, and by his personal efforts in research demonstrates his moral right to direct. This is possible only if the scientific organization leaves sufficient time for the director to do his scientific work.

Unfortunately, there enters into the sphere of scientific organizational work not only direction of the collective. Frequently an excess of different duties falls on leading scientists. The Presidium of the Academy of Science, USSR, discussing this problem recently, established that many academicians and corresponding members are *simultaneously* members of scientific councils, various commissions, academic organs, and the editorial staffs of many journals. They also participate in the work of the Higher Attestations Commission, organizational committees of scientific sessions and conferences, and the preparation of materials of insignificant problems.

The greatest time-eating evil is the "fidgeting" [nit-picking?] sessions of scientific councils and management institutes, ministries, committees, and other organizations which usually occur during work hours, and are often decided on suddenly at the most unexpected times. The subject of these sessions is frequently some current problem which could have been solved in the operating order by individual directors.

Even the sessions of the scientific councils of the institute devoted to the presentation of dissertations are irrationally organized. Council members rarely acquaint themselves beforehand with the dissertation and the discussion acquires a nonconcrete character. The opinions of opponents often repeat the basic position of the dissertation; critical observations and evaluations are sometimes hopelessly lost in the verbal morass.

On the other hand, there is the problem of the tremendous volume of organizational, consulting, propagandistic, and editorial work, a great part of which cannot be separated from the modern scientific life.

It is necessary to decrease the number of and duration of sessions. Concrete decisions must be presented, and problems must be worked out in the course of the sessions. The daily agenda must be freed from problems which can be solved in the operative order. Extensive reports must be replaced by brief communications. Detailed texts of the reports can be handed out beforehand.

Finally, brief, clear presentations should be required from participants in discussions.

An atmosphere of sharp intolerance to unintelligent conduct and lengthy sessions must be created.—END

The Bettmann Archive

Lunar population of winged folk and animals was "discovered" by British astronomer Sir John Herschel in nineteenth century. Later scientists showed moon to be a far less hospitable place.

Long before the first Lunik, poets and plain people looked to the moon in...

Spaceflights of Fancy

MARJORIE HOPE NICOLSON

NO MAN has yet visited the moon, but long before human beings began firing at and around it, many had imagined what they might find there. To poets, from the Greeks and Romans down through the Renaissance, the shining orb was the setting for the love story of Endymion and the moon goddess (Diana, Cynthia, Selene—her names were many). Centuries before the telescope proved that the moon was a world, philosophers like Democritus, Anaxagoras and Pythagoras surmised that it might be. Plato and Cicero in various ways imagined voyages into space. Plutarch described the moon as science was to find it—"cleft with many deep caves and ruptures."

The Greek satirist Lucian wrote two stories of moon voyages, in one of which a group of terrestrial mariners was carried to the moon in a ship by a whirlwind. In the other, a more ingenious lunar voyager, Icaromenippus, who had long "meditated upon the night skies" in which the "greatest marvel to me was the moon," made himself wings, one of a vulture, one of an eagle, and after a period of practice set off from Mount Olympus to the moon.

Lucian *fancied* a world in the moon; classical philosophers *presupposed* it by logic. But Galileo, "the man who saw through heaven," was the first mortal to *see* it with his eyes. In 1610 his *Sidereus Nuncius*—one of the most exciting works in the history of science—described the moon as Galileo saw it through his fifth telescope: "The moon certainly does not possess a smooth and polished surface but one rough and uneven, and, just like the earth itself, is everywhere full of vast protuberances, deep chasms, and sinuosities * * * everywhere varied by lofty mountains and deep valleys."

At first Galileo believed that some moon spots indicated seas, though later he insisted that the moon had no water and hence no atmosphere. As to life on the moon and planets, he said: "If the question be put to me, I will answer neither yes nor no."

Johann Kepler, the scientist and mystic who was a contemporary of Galileo, laid the basis for descriptions of the moon which was to be followed by imaginative writers for the next two and a half centuries. In a fictitious dream account called *Somnium,* published posthumously in 1634, Kepler's traveler was transported to the moon by daemons, a familiar theme in ancient superstition. But there fantasy ceased. More accurately than any writer for a hundred years after him, Kepler described what men probably will see when and if they reach the moon—described, too, what the Russians' camera in 1959 has reflected on "the other side of the moon."

Topographically, Kepler's moon world is much like earth, save that everything is on an exaggerated scale—mountains soaring to incredible heights, fissures more profound than any terrestrial canyons. His moon is divided into two zones, Privolva and Subvolva. The side we see, Subvolva,

TRIPLE-THREAT RADAR

Tactical bombers of the future will have a triple capability for low-level operations because of Stavid's contributions to a new bomb-directing system. With this equipment, bombers will be able to ferret out the enemy by day or night . . . anywhere, regardless of terrain.

The radar system, incorporating search, bombing, and terrain-avoidance modes, is now being developed in Stavid's laboratories and represents the latest state-of-the-art in transistorized airborne electronics. Through modular techniques and systems integration, the radar equipment is designed to meet all tactical situations involving modern attack aircraft.

Other airborne electronics projects include:

- Radar-Infrared Fire Control System MK22 MOD O
- Radar-Infrared Search-Track Set AN/ASG-13
- High Resolution Experimental Bombing System AN/APQ-49

Radar Systems Engineer, F. N. Bellew, now assigned to an advanced search and bombing radar system, has 15 years' experience in airborne electronics, including microwave systems, video amplifiers and cathode ray tube displays.

STAVID Engineering, Inc. Plainfield, New Jersey

Imaginative Electronics . . .

Outstanding engineers and scientists are invited to inquire into opportunities on Stavid's advanced systems engineering teams.

Ever try threading five needles at once?

Cubic has, electronically speaking. And far greater precision is required of the five-target Cubic MOPTAR which will be used by the Federal Aviation Agency to evaluate experimental air-traffic-control systems. MOPTAR (Multi-Object Phase Tracking and Ranging), an *omni-directional* system requiring *no moving antennas,* provides startlingly accurate real-time position data. MOPTAR can be expanded to track *hundreds of aircraft* simultaneously with this same accuracy. The FAA installation will monitor other systems in tests at the new National Aviation Facilities Experimental Center near Atlantic City. It's a new use for Cubic's Space Age tracking systems developed under the forward-looking sponsorship of the United States Air Force. Now MOPTAR finds a non-military application in helping solve the problems of air navigation, an application that will lead to greater safety in the traffic lanes of the sky.

MOPTAR

Tracking systems by Cubic . . . reliable precision systems with Space Age capability . . . find application in air traffic control and, through the multiple-target potential of MOPTAR, in increasing the fire-power of America's guided missiles.

CUBIC CORPORATION

ELECTRONIC ENGINEERING WITH A DIMENSION FOR THE FUTURE

5575 Kearny Villa Road, San Diego 11, Calif.

has its own moon, called Volva; but on "the other side of the moon" night is fifteen or sixteen days long "and dreadful with uninterrupted shadow." The climate is marked by extremes to which ours are nothing, heat more parching and cold more intense than at our equatorial or polar zones.

Life exists on Kepler's moon, though not the kind of life we know. In Subvolva, whatever is born is of gigantic dimensions; plants and creatures spring up in a single day to monstrous size, often to die when night comes. Some creatures are winged, some crawl, but all are of "a serpentine nature." They seem to us monsters of an antediluvian world, as momentarily basking in fierce heat, then creeping into darkness or flying upon prehistoric wing to disappear forever from the light of Volva, creatures of only a day.

This was the story most vivid in H. G. Wells's mind when he wrote *The First Men in the Moon.* His Bedford and Cavor found the moon world a place of mingled beauty and terror, with vegetation growing to incredible heights in a day, only to wither when the long night fell, as if, said Wells, "hurrying tumultuously to take advantage of the brief day in which it must flower and fruit and seed again and die." When Wells's captured travelers are bound and cast into the horror of deep caverns, the more philosophical Cavor remembers his reading: " 'Yes,' he said, 'Kepler, with his *subvolvani* (*sic*), was right after all!' "

Four years later than the *Somnium* appeared one of the most popular tales of the century—and of centuries to come—Francis Godwin's *Man in the Moone* a precursor of *Robinson Crusoe* and *Gulliver's Travels,* as well as of many other tales of adventure. Shipwrecked on an island, the hero, Domingo Gonsales, with his own "Man Friday," trained the gansas (wild swans or geese) to carry weights. In time Domingo harnessed himself to the birds, not knowing that this was their season for hibernation and that gansas hibernate on the moon. Off went the gansas and off went the intrepid Domingo, the only man in history to reach the moon by goosepower.

From a literary point of view, the most brilliant of the space voyages were the satires written by Cyrano de Bergerac in the mid-seventeenth century. Cyrano set off for the moon more than once. On one occasion he attached vials of dew to his body, on the theory that the sun sucked up dew and therefore, if he had sufficient dew, the sun would suck up Cyrano. Since he broke too many of his little bottles in an attempt to steer himself starboard or port (indeed, Cyrano on his voyages broke too many bottles of another sort, as well), his first trip landed him only in French Canada.

In later trips, Cyrano arrived at both moon and sun and had many adventures among men and customs in which he satirized his own world. In particular, he discovered lunar philosophers who proved by irrefutable logic that Cyrano did not exist—because logically it was impossible that nonlunarians existed.

Another example of the popularity of moon fantasies was the third book of *Gulliver's Travels,* in which Swift put a neat twist to what was already becoming a commonplace theme in literature. For centuries human imagination had sent men on voyages to the moon; in *Gulliver's Travels* the mountain came to Mohamet, as Gulliver looked up to see "a vast opaque body between me and the sun."

In this "Flying Island" Gulliver discovered many strange men and customs, such as mathematicians and musicians who would eat their meat only if cut into the figures of triangles and rhomboids or flutes and oboes. But most of all, he learned a lesson which his generation had deduced from Newton's *Principia*—the interrelationship of all parts of the universe. Swift's Flying Island flew over the earth in a course predetermined by terrestrial magnetism. It could control the great world below by shutting out light and air, but at the same time it was controlled by scientific laws of attraction and repulsion. Mainland and Flying Island, our world and the moon, Gulliver learned, "all are but parts of one stupendous whole."

Even before our own time, thoughtful minds considered what the conquest of space might mean to those of us who dwell on a comparatively small planet. In literary history, the moon has been claimed by Spaniards, Italians, Dutch, Germans, and British before it was actually struck by the Russians. Will a Russian flag upon the moon prove a prelude to international rivalry? Or will human beings on this little earth unite—as John Dryden suggested in his *Annus Mirabilis,* written as a memorial to England's rise, phoenixlike, from the ravages of the Great Plague and the Great Fire of 1666—to "make one City of the Universe?"—END

The article above was originally published in the New York Times *Magazine, issue of November 22, 1959. It is reprinted in* SPACE DIGEST *with permission of that publication and the author.*

Speaking of SPACE

Are We Alone in the Universe?

Are there stars in the Milky Way and other galaxies with families of planets? Would such planets support life? Are intelligent forms of living beings now in existence?

These are some of the favorite speculations of modern astronomy. Add to these possibilities one more: Could we communicate with other beings on other planets, ten to twenty light-years away? —and you have the exciting radio astronomy project called Ozma.

Radio astronomers, notably the famed Otto Struve, director of the new National Radio Astronomy Observatory at Green Bank, W. Va., think the answers to all these questions might be yes. His observatory's project, named after the queen of the storybook land of Oz, will direct the Green Bank radio telescope at a specific area of space in an attempt to tune in on messages that might be on the way to us from other creatures in space.

A recent article in the British science magazine, *Nature*, suggests that possible societies on other planets might have preceded our development by sufficient time so that their technology would have anticipated *our* evolution. If so, they may have attempted transmission of messages into space, to get the same answers we are looking for.

Early in 1960, possibly on New Year's Day, the Green Bank eighty-five-foot parabolic reflector antenna will be pointed at Tau Ceti and Epsilon Eridani, less than twelve light-years away from earth. The Green Bank receiver will sift out artificial noises coming from the earth and outer space. The rapid advance of radio astronomy in the past few years, as one of our newest sciences, may some day lead us to one of the most significant developments in man's history—communication with other worlds.

SNAP II, AEC's newly announced 220-pound reactor designed for use aboard space vehicles for auxiliary power, shown recently in Washington.

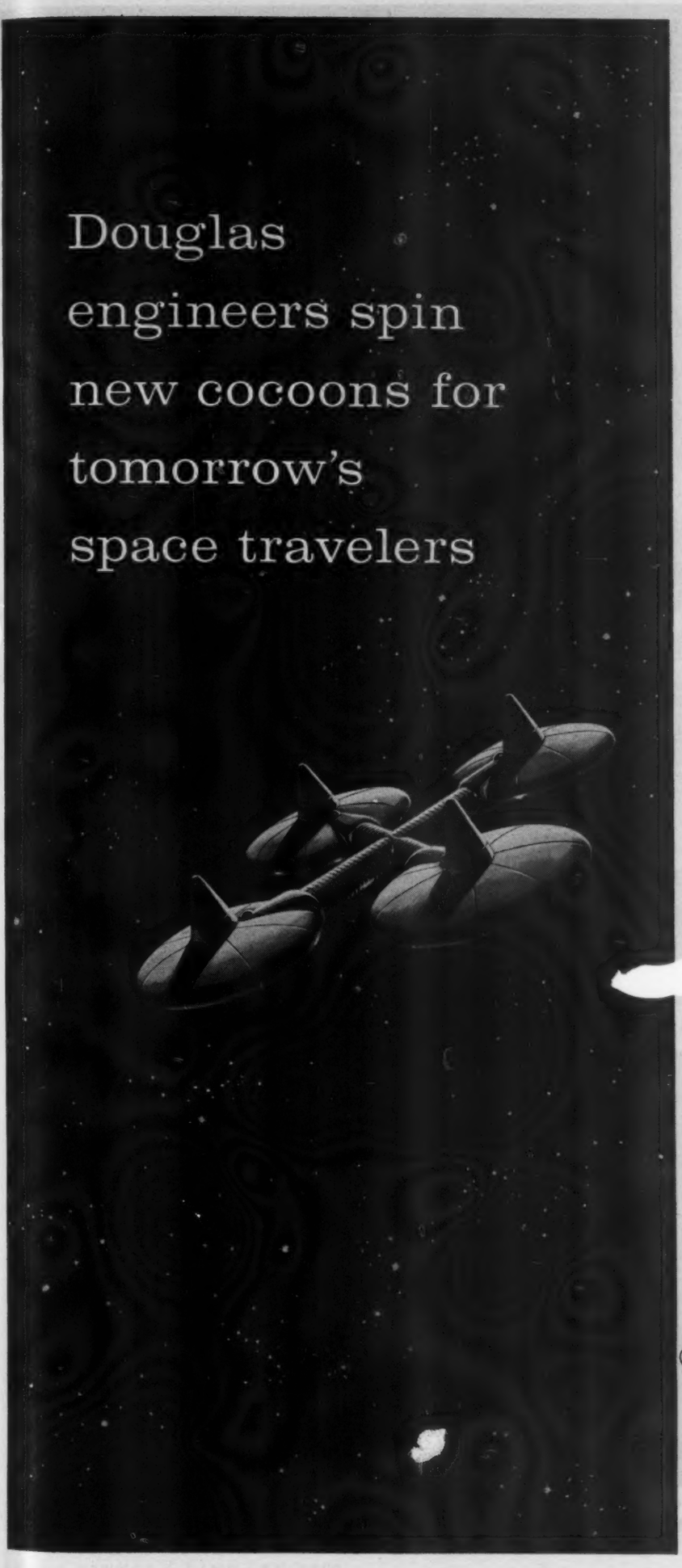
Soviets Join World Space Units

The United States and the Soviets have reached tentative agreement on the formation of the permanent United Nations committee to regulate peaceful uses of outer space. According to reports from US representative Henry Cabot Lodge and Soviet First Deputy Foreign Minister Vasily Kuznetsov, the group will have twelve western members, five neutral members, and seven from the Soviet bloc. The Russians boycotted the temporary committee formed a year ago because they felt they were not sufficiently represented.

As a permanent body of the UN, this committee may be able to study some of the present bars to international space programs, such as the dividing line between "national" space and "outer" space, legal sovereignty over the moon and other bodies that man may explore, and the control of future space traffic.

Also last month, the Soviet Academy of Science accepted a compromise formula that would give both East and West a veto over important decisions made by the Committee on Space Research —COSPAR—making it probable that the Soviets will rejoin that committee. The International Council of Scientific Unions set up COSPAR in October 1958 to continue the cooperation in space research initiated by the ICSU-sponsored IGY.

Douglas engineers spin new cocoons for tomorrow's space travelers



Space researchers in human factors engineering utilize latest discoveries of medical science

Each time a space traveler leaves home (earth) he has to be completely wrapped in a special environment. He needs it to survive under alien conditions such as extreme heat and cold, high vacuum, cosmic radiation and tremendous G forces.

At Douglas, life scientist research over the past ten years has explored more than *forty* basic factors relating to human survival in space. Douglas engineers are now completing – at military request – a careful survey of conditions that will be encountered en route to and on other planets.

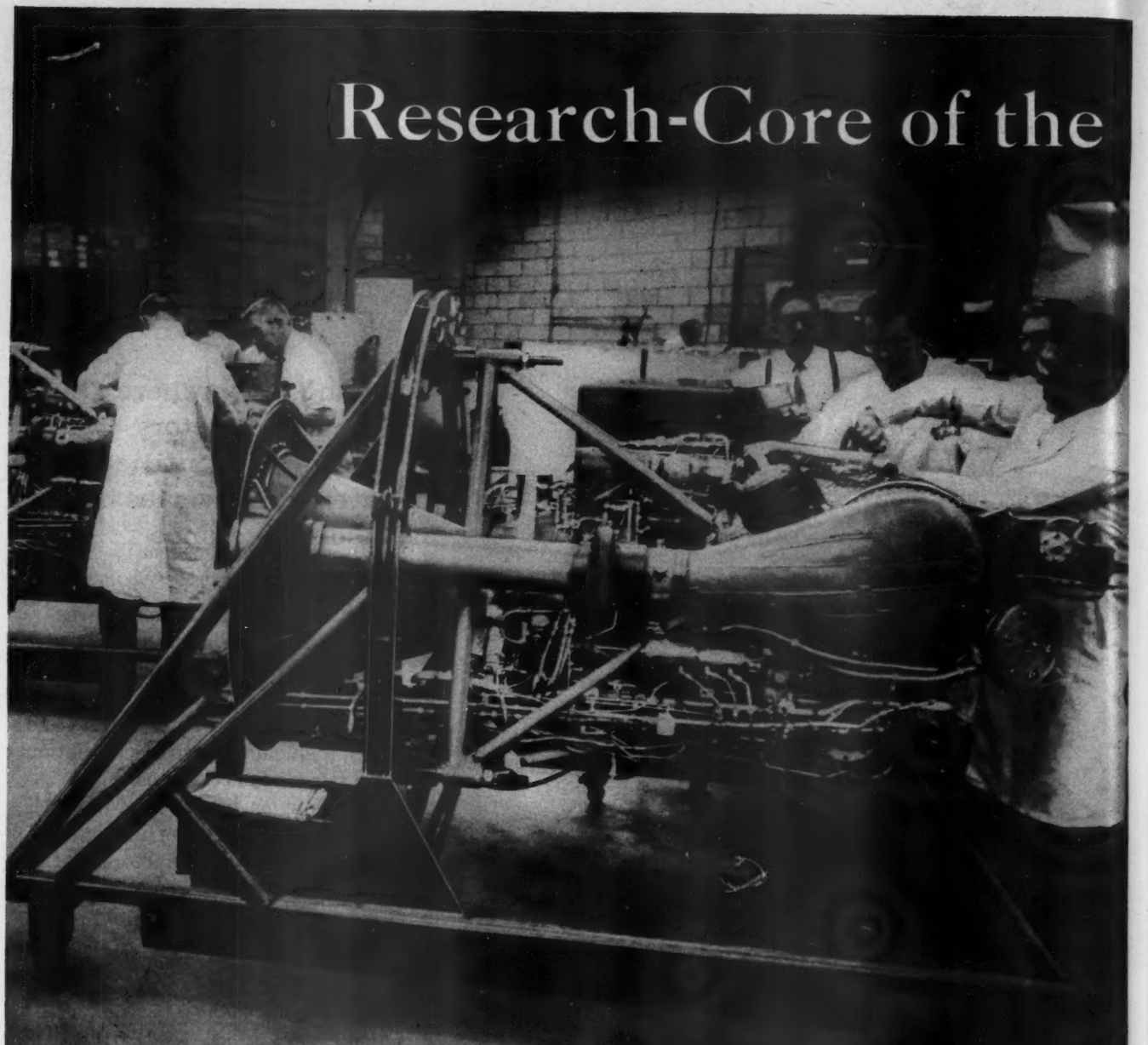
They are also evolving plans for practical space ships, space stations and moon stations in which men can live and work with security thousands of miles from their home planet.

Out of these research activities and those made by companion workers in this field has come new knowledge of great medical importance . . . even to those of us who are earthbound.

DOUGLAS

MISSILE AND SPACE SYSTEMS • MILITARY AIRCRAFT • DC-8 JETLINERS • TRANSPORT AIRCRAFT • AIRCOMB • GROUND SUPPORT EQUIPMENT

Research-Core of the



Most powerful single chamber liquid rocket engine ever built for manned flight—XLR-99—will drive the X-15

Test firing the XLR-99 . . . a major step in research supporting special design and production techniques.

North American Aviation Test Pilot, Scott Crossfield stands by the X-15—America's first manned space craft.

X-15

In designing and building the powerplant for the X-15, Reaction Motors Division of THIOKOL has tamed for human flight one of man's most awesome power sources, the large liquid rocket engine . . . has successfully met many of the greatest challenges ever put to rocket research.

Problem: develop an engine as powerful as an ICBM sustainer, make it controllable and pilot-safe.

This project without precedent demanded completely new concepts in chemistry and metallurgy, in laboratory testing, propellant handling, in use of exotic materials and fabricating techniques.

Basic and applied research in all these and other facets of rocket design and development have resulted in a throttlable powerplant conservatively rated at 50,000 lbs. of thrust (500,000 horsepower). An engine that will respond to pilot's wishes . . . fly him at speeds in excess of 4000 mph, better than 5 times the speed of sound . . . carry him to altitudes of 100 miles, the fringe of outer space . . . and above all bring him safely back to Mother Earth.

THIOKOL is now moving into new phases of rocket propulsion, opening up great career opportunities.

Engineers and scientists will find stimulating work in **astronautical systems analysis, thermodynamics, infra red, electronics of rocket exhaust, electromagnetics, solid state physics, high temperature gas dynamics, in many areas of fundamental and applied research.**

Opportunities also exist for chemists—in **propellant analysis, shock wave phenomena, combustion processes, fast reaction kinetics, high vacuum techniques.**

Inorganic Polymers, Propellant Formulation, Fluorine Synthesis, Metal Hydride Synthesis, Ion and Plasma Propulsion, Magnetohydrodynamics, Nucleonics . . . these are but a few of the additional areas in which accomplished and experienced people are needed.

The THIOKOL Chemical Corporation operates plants in Huntsville, Alabama; Moss Point, Mississippi; Brigham City, Utah; Bristol, Pennsylvania; Denville, New Jersey; Trenton, New Jersey; Elkton, Maryland; Marshall, Texas.

For full information, write Personnel Director at any plant address above.

Thiokol®

is Research to the Core

THIOKOL CHEMICAL CORPORATION
Bristol, Pennsylvania

®Registered trademark of the Thiokol Chemical Corp. for its rocket propellants, liquid polymers, plasticizers and other chemical products.

SPEAKING OF SPACE

Two black mousetronauts ready for launch from Vandenberg AFB, Calif., as part of the Discoverer program to study recovery of orbital capsules.

Space Speeches

Sir Charles Darwin, on our current population explosion and the possibility of relocating the world's excess on other planets: "The most serious problem in the world's future is overpopulation. In order to solve it by sending people off to other planets you'd have to send more than a thousand every day . . . and I don't think you'd have many volunteers, because the essential thing you'd have to tell them is not to come back."

David Sarnoff, Chairman of RCA, on the future of technology: "Not only must we learn to use the immense powers of technology efficiently but, what is more important, we must learn to use them to good purpose. Technology, by itself, is neither good nor evil. It can eliminate, with equal efficiency, polio or people. It opens up exhilarating vistas of higher living standards, a more satisfying life for all mankind. But these vistas are shadowed by peril, because man will have in his hands terrifying forces of destruction before he has learned to control and to utilize them beneficently."

On the future of electronics: ". . . the housewife's dream of a fully automatic system will at last be realized. One irreverent observer has suggested that there will be so many electronic gadgets in tomorrow's kitchen that meals will begin not with grace but with a countdown!"

Dr. George Kistiakowsky, Special Assistant to the President for Science and Technology, on our space rivalry with the Russians: "If one separates civilian space science and technology from military missiles . . . one wonders whether our insistence on superiority in space is of overriding importance. The unfortunate aspect is that space exploration has caught the public imagination to an extent that gives the Soviet achievements somewhat more importance than, perhaps, they rightfully deserve. The public reaction both here and abroad has been fostered assiduously—and not unnaturally—by the Soviet propaganda machine and, in a sense, by some of our own space enthusiasts. . . . Dictatorships are able to concentrate their national efforts more effectively than the democracies on limited objectives and thus gain a temporary superiority. Moreover, in view of

the general strength of the USSR, it would be totally unrealistic of us to expect that at any given time we should be their superiors at every point *on a broad scientific and technological* front. We must accept as a fact of life that in certain areas, which will vary from time to time, the Soviets will be ahead of us temporarily."

In the Space News:

Cornell University plans a Center for Radiophysics and Space Research, with a $4,500,000, 1,000-foot-radar installation in Puerto Rico. Director of the space center will be cosmologist Dr. Thomas Gold, currently Professor of Astronomy at Cornell. . . . *Your Career as an Aero/Space Engineer,* intended principally as an aid for high school students and counselors, is available from the Student Activities department of the Institute of the Aeronautical Sciences, 2 East 64th Street, New York 21, N. Y. . . . The Midwest Council on Airborne TV Instruction is looking for teachers of courses to be televised from a high-altitude plane which will relay programs from a ground-based transmitter to a potential audience of five million students in six states. Nominations will be accepted at the council's offices at Purdue University, Lafayette, Ind. . . . The Aerospace Medical Association invites speakers to participate in its 31st annual meeting, to be held at the Americana Hotel in Miami Beach, Fla., May 9-11, 1960. . . . Glenn T. Seaborg, nuclear scientist and Chancellor of the University of California, Berkeley, is the 1959 winner of the Atomic Energy Commission's Enrico Fermi Award.

GEORGE "MOON" MEYERS—By Jack Tippit

"There I was at 159,000 miles up in space, when I decided to take this shortcut I'd heard so much about."

Edible Seaweed

The future traveler's preference for algae cookies, as proposed by US scientists, or for powdered seaweed may decide whether he makes his journey via US or Russian spaceships. According to a report in the Moscow *News,* the Department of Biology at Leningrad University expects unicellular lower seaweed—"vegetable meat"—to be man's food during interplanetary voyages. A greenish powder produced from this seaweed is said to be high in nutritive qualities, containing "more vitamins than lemons and more protein than beans." Similar to algae, seaweed will absorb carbon dioxide and release oxygen.

In the Journals:

In the November-December *National Defense Transportation Journal,* Marvin A. Rapp, associate executive dean, State University of New York, compares the cost of satellite transportation with more conventional forms: ". . . at a velocity on the order of 18,000 miles an hour . . . Explorer I, with an estimated lifetime of ten years, will, at the end of its lifetime, cost only one-tenth of a cent per mile. Compare this with the average cost per ton-mile of regular transportation systems: commercial air—4.6¢; trucks—4.3¢; rail—2.8¢; water—1.8¢."

"Could the Satellites of Mars Be Artificial?" Not according to Clyde Tombaugh, writing in the December issue of *Astronautics.* Despite recent Soviet suggestions that the Martian moons, Phobos and Deimos—Fear and Terror—may be artificial in origin, a leading American planetary astronomer reasons that they must be natural bodies.

Bart J. Bok reports in the December *Scientific American* on new combinations of optical techniques and radio evidence that are enabling astronomers to prove long-held theories about our spiral galaxy. "The Arms of the Galaxy," he believes, were formed rather recently, and, cosmically speaking, may be rather short-lived.

—MICHAEL B. MILLER

To assure a new order of reliability

MICRO-MODULE

EQUIPMENT

The micro-module is a new dimension in military electronics. It offers answers to the urgent and growing need for equipment which is smaller, lighter, more reliable and easier to maintain. Large scale automatic assembly will bring down the high cost of complex, military electronic equipment. Looking into the immediate future, we see a tactical digital computer occupying a space of less than two cubic feet. It will be capable of translating range, wind velocity, target position, barometric pressure, and other data into information for surface to surface missile firings. The soldier-technician monitoring the exchange of computer data will have modularized communications with the other elements of his tactical organization. RCA is the leader contractor of this important United States Army Signal Corps program and is working in close harmony with the electronic components industry.

RCA Tmk(s)®

RADIO CORPORATION of AMERICA

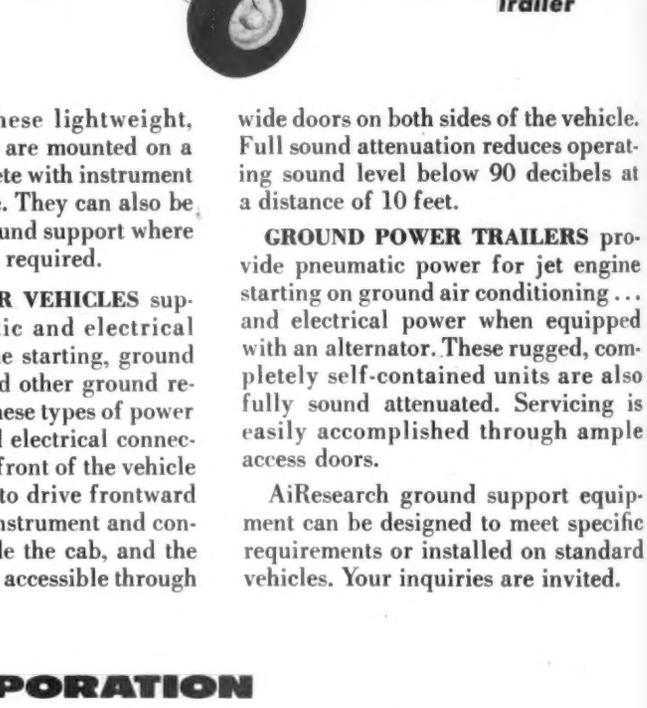
DEFENSE ELECTRONIC PRODUCTS

CAMDEN, NEW JERSEY

Versatile Ground Support for Jet Transport Fleets

Ground Power Flyaway Unit

Ground Power Vehicle



Ground Power Trailer

8,500 AiResearch Gas Turbine Units in Use

Extremely reliable and diversified, AiResearch mobile ground support equipment provides main engine starting for turbine-powered aircraft, and ground air conditioning and electrical power for both aircraft and missiles.

Heart of the lightweight ground support systems are AiResearch gas turbine compressors which provide pneumatic and/or electrical power. Electrical power is supplied when the unit is coupled with an alternator.

GROUND POWER FLYAWAY UNITS for jet engine starting are designed to meet the need for a mobile low cost pneumatic power source which is readily air portable for emergency use. These lightweight, self-contained units are mounted on a compact cart complete with instrument panel and enclosure. They can also be used for missile ground support where pneumatic power is required.

GROUND POWER VEHICLES supply both pneumatic and electrical power for jet engine starting, ground air conditioning and other ground requirements where these types of power are needed. Air and electrical connections located at the front of the vehicle allow the operator to drive frontward into position. The instrument and control panel are inside the cab, and the power unit is easily accessible through wide doors on both sides of the vehicle. Full sound attenuation reduces operating sound level below 90 decibels at a distance of 10 feet.

GROUND POWER TRAILERS provide pneumatic power for jet engine starting on ground air conditioning . . . and electrical power when equipped with an alternator. These rugged, completely self-contained units are also fully sound attenuated. Servicing is easily accomplished through ample access doors.

AiResearch ground support equipment can be designed to meet specific requirements or installed on standard vehicles. Your inquiries are invited.

THE GARRETT CORPORATION

AiResearch Manufacturing Divisions

Los Angeles 45, California • Phoenix, Arizona

Systems, Packages and Components for: AIRCRAFT, MISSILE, ELECTRONIC, NUCLEAR AND INDUSTRIAL APPLICATIONS

The Bettmann Archive

In war with Tripoli, 1804, US Navy's Lt. Stephen Decatur burns the frigate *Philadelphia*, which had been captured and converted by the Barbary pirates. Since 1794, when Congress authorized the building of six frigates, US has been involved without letup in world affairs.

The Discouraging History of Disarmament

Jerry Greene

There is no quarrel with considering disarmament as a laudable goal for nations. But such consideration can be fruitful only if made within a realistic framework of things as they are, not as we would wish them to be. The history of man's past efforts to stop killing off the race offers sobering lessons to those concerned with future efforts in that direction. It is to this end that we present the views of the Military Editor of the New York Daily News on . . .

PROBABLY for precisely the same reason few of them dare say anything good about sin, regardless of personal preference, most people seem exceedingly reluctant to think aloud about the snare and delusion known as disarmament. The American public generally and many potent leaders in particular have kidded themselves to the danger point on the score in the search for an eternal peace which no longer can be called as close as the moon.

Disarmament, in truth, is a treacherous and deceitful word, describing a state of affairs that has no place in the design for modern living in this generation, or the next.

But the big drive is on again, to be muddled up in a presidential campaign year, with the free world's statesmen and politicians in a dither over Soviet Premier Nikita Khrushchev's "total" disarmament proposal. This proposition, made before the United Nations General Assembly when Khrushchev visited this country, has won yards of headlines and will get more. In reality, it merits much less serious consideration than the label on an empty beer bottle.

Perhaps even more dangerous, because the US already has got its feet wet in this direction, is the move for halting tests of nuclear weapons. Scores of high-placed scientists and other persons demand such a suspension or perpetual ban to stop alleged contamination of the atmosphere, the possible poisoning of future generations, and hypothesized mass extermination. Such warnings also make headlines.

But buried at the back of the newspaper are reports from other qualified scientists who are convinced that the others' fears are pure nonsense, that, indeed, America's security and way of life are endangered by deferring nuclear experiments. These latter thoughts appear to be realistic and are, therefore, unpopular.

There is grave danger to the nation, in fact, in a nuclear-needled, wild-eyed charge forward toward the ever-elusive and phantom goal labeled "eternal peace." Certainly, and justly so, there is no greater hope in the adult mind than that for peace with an end to tensions and cold wars, to hot wars and the brutalities and senseless waste of armed combat.

(Continued on following page)

THE DISCOURAGING HISTORY OF DISARMAMENT

But the way to this goal is not to be found under the falsely glittering torches carried by the priests of disarmament. In that direction lies the risk of destruction, blithely ignored by wishful thinkers or selfish schemers who invite themselves into the act for their own purposes.

One would think the gall of Korea still fouling the mouth of America would be reminder enough of what's to be had from mental and physical demobilization and disarmament. But such trifles are too soon forgotten by too many.

Long before Khrushchev tossed his thrice-chewed bone into the Western kennels, ten nations, some of which could not by themselves arm the Boy Scout Beaver Patrol for an overnight hike, agreed to sit down in Geneva early next year for another pass at the disarmament myth. Discussions have been continuing there, as well, on the subject of a nuclear ban. It is well past time for the home-loving, tax-paying citizens of the United States to take a careful look at the form sheet in this whole matter.

For nearly 6,000 years of recorded history men have been working up a fine batch of blisters and bunions in the fruitless search for a workable apparatus for international disarmament. The only tangible trophy yet won could be described as a combination of waste and needless suffering on the part of those who in all innocent sincerity made a pass at laying that pistol down.

The dreadful fact that one bomb can now cause the havoc of 100,000 of yesterday's models alters the situation only in small degree. The fundamental element, the mind of man, remains unchanged.

The first ultimate weapon, so top secret not even the Russians have yet claimed its discovery, was used in the original battle of annihilation which exterminated twenty-five percent of the human race. It was reported somewhat casually in the Book of Genesis in these laconic words: "Cain rose up against Abel, his brother, and slew him."

This was written, the scholars say, in the year 4,004 B. C., and the Biblical records for the next two score centuries are packed with accounts of war, privation, torture, and slaughter.

There can be scant doubt that the words "swords into plowshares," the ancient phrase packed with hope, is one of the best-known quotations in the Western world as we know it, but rarely is the whole sentence spoken by the Prophet Isaiah recited. That committee in Geneva next spring might paint all of it above the door for luck, anyhow. It reads:

"And He shall judge among the nations, and shall rebuke many people; and they shall beat their swords into plowshares and their spears into pruning hooks; nation shall not lift up sword against nation, neither shall they learn war any more."

This, centuries before Christ was born and, perhaps with apologies, somewhat before N. Khrushchev butchered his way through Hungary on wings of peace.

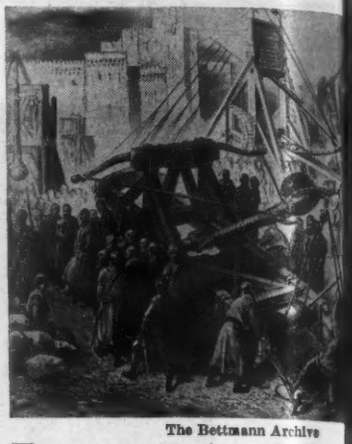
Unfortunately, every time man has laid a hot sword on the anvil, somebody has slugged him back of the ear. It would be folly to assume that this of all of them, with its firmly established penchant for messing things up, is the chosen generation to fulfill old Isaiah's findings for the future. The stars just aren't right, and besides the skies are getting cluttered up with man-made gadgets which could upset any prophet's timing.

The same fears which trouble the world today have reverberated through diplomatic corridors back through the ages in each instance where a new gadget has been developed to refine the art of killing for big and little wars.

Take a look at the crossbow. It was morally quite proper for Christians to use this clumsy thing in the Crusades against the heathen. But the Pope himself had a hand in a disarmament conference which banned the device in battle among the Christians themselves. Charles Boutell, in *Arms and Armor in Antiquity* (London, 1905), reports the ban of the crossbow "as being too murderous a weapon" at the Second Lateran Council held in Rome in 1139.

The Bettmann Archive

Ancient man at war. Then as now, attackers and defenders. Their battle site, the cliffs they called home.



The Bettmann Archive

Weapon system, time of the Crusades. Christians' huge "missile launcher" in seige of Moslem-held Holy City.

The Bettmann Archive

Major struggle of ancient times was between Greece and Persia. This old drawing, after a painting, depicts the Greek phalanx formation deployed against the Persians.

So what happened? Contemporaries paid the usual respects to the edict and kept right on using the crossbow until something better showed up. That can be given as exact a date as the Hiroshima bomb—August 26, 1346, at the Battle of Crécy. With, no doubt, a good, pious nod to the Second Laterans, the French hired 6,000 Genoese crossbow hoodlums to help meet the English, who then as more recently landed an invasion force near Cherbourg. The almost unknown English archers with the longbow used its superior range and accuracy to rip up the crossbowmen and then went to work on the French cavalry.

Thus it was the longbow two centuries later that put the necessary teeth in the Lateran Council findings, and, of course, better and more deadly weapons already were in whatever they called the research and development stage in those days.

The astute military historian Walter Millis in *Arms and Men*, though he raises disturbed questions of the future toward the end of the book, sets forth the issue clearly in discussing the realistic view of armed conflict taken by the world statesmen of the eighteenth century—and save for the vastly improved power of the nuclear bomb there is not any evidence at hand to indicate much change in the basic situation.

"They were ready to admit," Millis writes of yesterday's statesmen, "perhaps more realistically than many of their

successors, that behind all the moral and legal imperatives there has always remained an element of brute force; that violence was not only an ultimate but possibly an indispensable sanction in human affairs. Issues of pride, greed, ambition, or interest were bound to arise among men, for which there could be no decision except by force, but which yet had to be decided in one sense or another if society was to continue to operate."

From the day of its birth as a nation, the US has never needed a disarmament conference to fire up the forge for Operation Plowshare. For this is a lazy man's country, ever rebellious against discipline in any form, with a built-in fetish against physical exertion and hardship if such can be avoided through production of any type of labor-saving apparatus.

All this nation has required as an overpowering stimulant for disarmament has been victory in a war, regardless of size. Comes a conquest and the citizens convince themselves there'll never be need for another battle, this baffling mental quirk persisting despite the fact that in its short history the United States has rarely known an air free of the acrid fumes of gunpowder. Almost without exception, we have wrecked one fighting machine of high capabilities after another, usually completing the chore just in time to start building another one.

Strange, too, is the peculiar misbelief widely held and freely used or abused by some politicians that this nation was ever isolationist or free from foreign entanglements.

As early as 1794 Congress authorized construction of six frigates to protect our interests from the Barbary pirates in the Mediterranean. From that date we have been involved in world affairs without letup. Our current global network of military bases is nothing more than a mighty extension of a historic trend toward greater and greater involvement.

Gen. George Washington himself supervised the first US unilateral disarmament program—we had "send-the-boys-home" riots on April 11, 1783, within three weeks of the formal end of hostilities in the Revolution. Washington cut the Regular forces in that year to 2,631 men and got himself tangled up with reliance on a militia system which has been a controversial but often valuable feature of our national military posture ever since.

The War of 1812 and its aftermath saw the pattern repeated and so firmly implanted that it apparently has been accepted as a hallowed American heritage. The maximum armed strength in that minor scuffle was 38,000. Six years after that peak was reached Congress had cut back the Regular Army to 6,183.

On came further wars with dependable regularity. Never were we prepared. Always we built a sufficient combat force for the purpose of the moment, and always when the shooting stopped we spat in the eye of the Regulars, sent the militia back to the farm, and headed for the blacksmith shop with the plowshare pattern in hand.

Occasionally, even in peace, a President has thumped his chest or a congressman has bellowed for some ship construction in his district. One President ahead of his time was Gen. Benjamin Harrison, who rose from second lieutenant to brigadier in the Civil War. With small updating changes, President Eisenhower could have properly addressed to Khrushchev the Harrison statement of policy included in his annual message to Congress in 1891:

"The world needs no assurance of the peaceful purposes of the United States, but we shall probably be in the future more largely a competitor in the commerce of the world, and it is essential to the dignity of this nation and to that peaceful influence which it should exercise in this hemisphere that its Navy should be adequate both upon the shores of the Atlantic and of the Pacific."

Our latter-day wistful and hurtful nibbling at the disarmament pie in the sky began seriously in the years just before World War I. We have been chewing away at this mouthful of cotton with large zeal almost without interruption, except for two global conflicts and Korea.

Horse-borne combat between Scot and Briton, Bannockburn, 1314.

The Bettmann Archive

Medieval "ultimate weapon," the deadly crossbow, which made experts in its use the terror of war-ridden era.

The Bettmann Archive

The Bettmann Archive

Battle of Crécy in 1346. Crossbow gave way in the battle to deadly superior range of English longbowmen who won the fateful day.

Few citizen-taxpayers recall that the Navy ship construction legislation enacted in 1916, during the customary too-late preparedness campaign, included a clause directing the Administration to call a naval disarmament conference *immediately after the end of the war in Europe*. Nowhere in our history books have we found so perfect an example of inability to understand the realities of world power and world politics.

Not that it made any difference in the long haul, but Congress refused to go along with President Woodrow Wilson and his ideas on disarmament and the League of Nations. Then it watched in amazement as President Warren G. Harding and his Secretary of State, Charles Evans Hughes, jumped smack into the bypassed booby trap. Hughes hauled out the old 1916 naval act and talked Harding into calling the Washington Disarmament Conference of 1921-1922.

The Army, naturally, took its usual rap and was withered away by the Congress from 4,000,000 to fewer than 120,000 men in about eight years. The Washington Conference established the 5-5-3 capital ship ratio among the US, Britain, and Japan, set up a ten-year moratorium on battleship construction, and then saw the noble agreement last just as long as it pleased Japan—which wasn't very long.

Sen. Hubert Humphrey, the Minnesota Democrat, is probably today's outstanding leader in the disarmament world. As chairman of the Senate Foreign Relations Subcommittee on Disarmament, he has directed a two-year study on the subject.

(Continued on following page)

THE DISCOURAGING HISTORY OF DISARMAMENT

During his visit to the US last fall, Soviet Premier Nikita Khrushchev took advantage of opportunity to propagandize for his deceptively simple "everybody-disarm" formula. He is shown addressing the General Assembly of the United Nations, which he employed as a platform for announcement of his plan. It was skeptically received by wary Western delegates.

And in this vigorous pursuit of the will-o'-the-wisp, he has found in the past and present some self-evident truths.

"There is a sober warning to the American people," Humphrey wrote in one of his interim reports, "in the experiences with disarmament in the past. There is also much in them that is pertinent to the problem as it confronts us today. These past experiences can help us avoid the pitfalls of either unwarranted optimism or blind futility."

His Senate subcommittee as a whole discovered, perhaps to its surprise, that "disarmament is a vast subject with many ramifications—political, military, scientific, economic, and legal."

The Humphrey reports include a finding of interest by Stefan T. Possony, professor of international politics at Georgetown University.

"On the whole," Possony advised the subcommittee, "the historical record shows that the various disarmament programs which were proposed and initiated in the past have operated to the detriment of the democratic nations. More specifically, unreasoned Western disarmament during the twenties and thirties was one of the prime conditions of World War II."

Point Four of Woodrow Wilson's ill-starred fourteen points called for a reduction in armaments, and then of course there was the Treaty of Versailles of 1919, which the US never signed. That one demobilized Germany about as thoroughly as possible, but the remnants of the old General Staff were busy at methods of circumvention even before the document became effective.

Seven more treaties were signed or international actions taken to limit arms before the Washington Conference in 1922. France refused to sign a separate pact intended to prevent use of submarines and poison gas—the US Senate ratified this one—and it never became effective. (We refused to sign another antigas protocol adopted at Geneva in 1925.)

The next few years saw the outbreak of a rash of disarming moves by the League of Nations, at least a score of them, before the master work, the Treaty for the Renunciation of War, commonly known as the Kellogg-Briand Pact, burst into bloom in 1928. A year earlier the Russians had first come up with the lemon recently resqueezed by Khrushchev, when Russia's Maxim Litvinov proposed, at Geneva, complete and immediate disarmament.

This Kellogg-Briand Pact deserves special attention, for here more than sixty nations signed on the dotted line and foreswore war forever. The US got global minded this time, helping promote a pact much more inclusive than initially intended by its sponsors. France intended much less.

Volume Sixteen of the *Encyclopaedia Britannica* has this to say in this connection:

"Although great hopes were entertained at the time of the effect which these declarations would have in the preservation of peace, they had no observable deterrent effect upon the aggressions which shortly followed in Manchuria in 1931 or in China proper at a later stage; nor upon the Italian invasion of Ethiopia, nor upon the German-Italian interventions in Spain, nor on any of those which finally culminated in World War II.

"The Kellogg Pact and other agreements for the renunciation of war, however, had one legal effect of some importance. They helped make it expedient for states to refrain

from formal declarations of war. Thus, though Japan in 1937 began to bombard Chinese cities and kill Chinese citizens in great numbers, she was not formally at 'war.' The bombardment and the killings were an 'incident' of 'intervention for the restoration of order.' Other states at times followed the example so set."

The US couldn't keep its nose clean, League of Nations membership or not. We became one of the sixty nations represented at the League's Conference for the reduction and Limitation of Armaments which met first in Geneva on February 2, 1932, and kept in business one way or another until May 31, 1937.

This confab gently shut its eyes while the League of Nations crumbled away to the sounds of troops marching and artillery registering in on target. The record should be well known. Germany walked out and took over the Rhineland. Presidents Herbert Hoover and Franklin Roosevelt sent the conference encouraging messages at intervals. Civil war broke out in Spain. Japan quit the League, terminated the Washington Naval Treaty, and started a war with China. To punish Italy for invading Ethiopia in one of the least excusable minor troop exercises of recent years, the League invoked "sanctions" against the invaders—but politely exempted from the naval blockade the two items Italy really wanted, oil and copper.

The US had a Senate investigation of the munitions industry, producing eventually the famed neutrality acts of 1935, 1936, and 1937 which were promptly junked sixty days after Britain went to war with Germany.

One of the hangovers from World War II, conceived while people were shooting seriously, appears here to stay for a while. It is the United Nations, and as a propaganda sounding board it makes the old League shake its marble halls in shame.

Senator Humphrey's subcommittee needed nineteen printed pages merely to list, with brief notations, the actions taken, proposed, and mostly just argued in the United Nations from January 24, 1946, to March 19, 1956, concerning disarmament. There have been multiple additions since that latter date, all surmounted by the Khrushchev "total-disarmament" blurt.

Only the most incurable optimist would say without smiling that the principal nations are one word closer to agreement than a dozen years ago.

Because of the awesome power of nuclear weapons (which are scarcely more lethal than some of the chemical, bacteriological, and biological agents available in quantity) and because the highly debatable danger of fallout poses threats not fully known, many deeply concerned people today worry about potential extermination of the human race if atomic war comes.

Should there be another war it will, no more than the others in history's long pages, necessarily mean annihilation of the race or the turning of the earth into a charred cinder. Of a certainty that isn't the way the Russians see it. Our scholars, military and civilian, know of these things, and they have wronged the public by not telling what they know.

Mass massacres have been common in the history of war; the US burned to death 100,000 Japanese in a single firebomb raid on Tokyo before the nuclear weapons were used.

If the Russians attack, they will intend to conquer, then use the human and physical resources of the captive nations in the manner already ably demonstrated behind the Iron Curtain. And there is scant profit in destroying something you want to use yourself. They would not be out to destroy the world.

But the Russians are teaching their armies that their target is not the civilian populace of the West, not the undefended cities, but the military might of the United States and its allies. Dr. Raymond Garthoff, outstanding expert on Russian affairs, notes these matters in his book, *Soviet Strategy in the Nuclear Age*. He finds that as recently as 1957, Maj. Gen. M. A. Mil'shstein and Col. A. K. Slobodenko wrote:

"Wars are won only when the enemy's will to resist is broken and that can only be broken, as the experience of history shows, when the armed forces of the enemy are destroyed. Therefore, the objective of combat operations must be the destruction of the armed forces, and not strategic bombing of targets in the rear."

The over-all picture was well put in a report last year by a group studying international security for the Rockefeller Brothers Fund, Inc. It said, "This panel, as all Americans, considers the achievement of a free and peaceful world the primary challenge before mankind. It would be highly irresponsible, however, to raise hopes which cannot be fulfilled or to hold out prospects which on closer examination prove to increase our peril."

A common-sense examination of the facts presently before us makes it evident that banning nuclear tests or giving more than passing consideration to illusory Red disarmament overtures would increase the nation's peril. Our nation must not be misled by those false hopes, even in an election year.

The sad seeds of conflict are spread from Berlin to Laos and almost all points in between, both ways. Captive nations yearn for freedom which only battle could bring. No conqueror has long tamed seething middle Europe and the Balkans in quite a few years; there is no reason to believe that Premier Khrushchev and the Soviets will accomplish the task in less than a few generations, if then.

Let the leaders of the nations sign another solemn pledge against war, sign it at the UN with bugles singing, and there'll be no guarantee of its meaning any more than a series of such pacts reaching back into history. No nation is likely to surrender enough of its sovereignty to permit creation of a sizable, competent UN military police force, the one possible means of bringing about and enforcing disarmament and lasting peace. This may come, but not soon.

The alternative is clear and simple. America's best military brains have been giving Congress the hard facts for fourteen years; they still await true action and some are stubborn enough to be hopeful.

The essence of their conclusions is this: The US must accept air, ground, and sea troops as first-class citizens, earning a living in an honorable, stable profession. There must be—for at least fifty more years—a dependable, permanent military structure built around 3,000,000 men regularly on duty, backed by an efficient, highly trained single Reserve force. The forces must be given constantly the newest and the best weapons; they must be forever removed from the blow-hot-blow-cold political squirming the US loves so dearly.

Of course this would cost money. But disarmament at present could cost life itself.—END

A native Arkansan and Marine veteran, Jerry Greene has covered everything from executions to politics in a news career that began in the early thirties. He joined the Washington Bureau of the New York Daily News *in 1945 and has specialized in the coverage of military affairs ever since.*

The READY ROOM

RESERVE AND AIR GUARD NEWS

Host Team Wins Ellington 'Rodeo'

The host wing carried off top honors in the **third annual Air Force Reserve Troop Carrier Rodeo** at Ellington AFB, Tex., in November. Ellington's **446th San Jacinto Wing,** commanded by **Col. Russell F. Gustke,** scored 3,960 points in the two-day paradrop and overwater navigation meet to win by more than 600 points.

The **349th Wing of Hamilton AFB, Calif.,** under **Brig. Gen. Rollin B. Moore, Jr.,** was second. Third place went to the **442d Wing of Richards-Gebaur AFB, Mo.,** commanded by **Col. Charles D. Daily.**

The event drew more than 700 Reserve and active Air Force personnel, headed by **forty-two crews representing** the fourteen **AFR wings** which fly the **Fairchild C-119 Flying Boxcar.**

As an indication of the stiff competition, last year's champion, the **435th Flamingo Wing of Miami, Fla.,** finished ninth, although it won single mission honors for low-level airdrop.

In an overwater navigation mission, a crew from the **453d Wing, Long Beach, Calif.,** achieved the first perfect drop-time score recorded in the three meets, and a team from **New York's 514th,** operating at 1,200 feet, missed a drop-target bulls-eye by only nine feet.

Wings finished in this order behind the three place winners: 94th, **Bedford, Mass.;** 440th, **Milwaukee, Wis.;** 452d, **Long Beach, Calif.;** 403d, **Detroit, Mich.;** 514th, **Mitchel AFB, N. Y.;** 435th, **Miami, Fla.;** 433d, **San Antonio, Tex.;** 302d, **Wilmington, Ohio;** 459th, **Washington, D. C.;** 512th, **Willow Grove, Pa.,** and 434th, **Bakalar AFB, Ind.**

A Day to Remember

As things now stand, **June 30, 1960,** is a key date in the **career of many Reserve forces officers.**

That's the day **mandatory retirement or discharge provisions** go into effect for **Reserve lieutenant colonels or below** with twenty-eight years' commissioned service, **colonels and brigadier generals** with thirty years' service or five years in grade (whichever is later), and **major generals** with thirty-five years' service or five years in grade.

Individuals who are **on permanent promotion lists but not yet promoted** at the time they hit the maximums come under criteria for the higher grade.

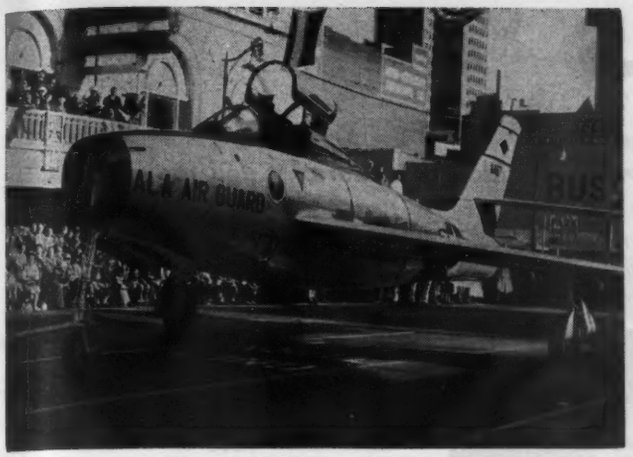
Under the **original ROPA act of 1954** these provisions would have become **effective three years ago,** but an amendment in 1955 **extended the date** to June 30, 1960. The basic objective of this feature of the law is to make **room for promotion of qualified junior officers.**

Most officers not on active duty should find **no real hardship** in the law, other than the **loss of drill pay,** since they will already have qualified for retirement pay beginning at age sixty. An **exception** are those officers serving **in technician slots in the Reserve and Guard** who, under present law, **cannot continue as technicians unless they hold a UMD position** in the unit. They would lose their civilian jobs when they entered the retired Reserve.

But for **Reserve officers on extended active duty,** the provisions could be all-important, in that those affected would be **required to retire if they qualify for retirement by reason of twenty years' active service,** or transfer to the **retired Reserve** to await retirement pay at age sixty if they have **twenty years' total service,** but **less than twenty years' active duty.**

Some **amendments to ROPA** are now being developed in the Department of Defense but no firm information is available at this time on them or on the treatment they may be accorded in Congress. It is understood that the language of **H. R. 8186,** containing ROPA amendments passed by the House last summer but not yet considered by the Senate, **may be modified by the DoD amendments.**

Smith Board was appointed by Air Force Secretary Douglas to report on Reserve forces functions. Its recommendations have not yet been released. Above, board members, left to right in front row: Brig. Gen. Jack G. Merrell, MATS; Brig. Gen. John O. Bradshaw, AFR; Maj. Gen. Daniel W. Jenkins, TAC; Maj. Gen. Sory Smith, 4th AF, chairman; Maj. Gen. Alfred Kalberer, CONAC; and Maj. Gen. William K. Martin, SAC. Middle row: Col. Gordon Doolittle, USAF (Plans); Brig. Gen. Emmett B. Cassady, AMC; Brig. Gen. Allison Maxwell, ANG; Brig. Gen. Bertram C. Harrison, USAF (Personnel); Brig. Gen. Prescott M. Spicer, ADC; Brig. Gen. Kenneth Stiles, AFR; Brig. Gen. Donald J. Strait, ANG; and Col. Billy G. Dilworth, USAF (Programs). Back row: Col. Carrol S. Geddes, Col. Leland D. Perry, Lt. Col. William H. Parrott, Col. Arthur Smith, Lt. Col. Everett T. Delaney, Lt. Col. Edgar C. Miller, Mr. Roland H. Riel, and Col. John P. Pesch. Colonel Perry is secretary of the board, Colonel Parrott its recorder. All are from Hq. USAF. AFA's Reserve and Guard Councils will comment on Smith Report whenever it is released in response to request from Secretary Douglas.



Air National Guard F-84F rolls through the streets of Birmingham, Ala., during city's traditional Veterans' Day parade. Plane belongs to 106th Tac-Recon Squadron.

Training with a Payoff

Early last fall the Air Guard undertook a trial commitment to perform a **tactical firepower demonstration** before Army **combat troops at Fort Sill, Okla.** These demonstrations had been flown by the **Tactical Air Command** for Army audiences from time to time; TAC asked the Guard to try one on for size.

The **122d Tactical Fighter Wing of Indiana** handled the demonstration, calling together **eighteen aircrews and support personnel** from its squadrons in **Indiana and Ohio** for seven days' active duty. Army leaders at Fort Sill and TAC representatives were **well satisfied.**

So much so that TAC has now asked the Guard to take on **three more demonstrations** in February. Plans call for the **102d Tactical Fighter Wing** of **Massachusetts and Connecticut** to stage a demonstration at **Fort Bragg, N. C.,** Ohio's **121st Wing** to go to **Fort Knox, Ky.,** and the **131st Wing of Missouri and Illinois** to repeat at **Fort Sill.**

Meanwhile, TAC has delegated to Air Guardsmen **two other assignments with Army units.** The **146th Tactical Fighter Wing of Van Nuys, Calif.,** is to employ **eight F-86H** aircraft and crews on each of four field maneuvers at **Fort Lewis, Wash.,** between now and the end of March. And four **RB-57s** from the **154th Tactical Reconnaissance Squadron** at **Little Rock, Ark.,** will go to **Alaska** early next month to participate with the Army in a cold weather defense exercise, **Operation Little Bear.**

The **National Guard Bureau,** in announcing these assignments, noted that they give the Air Guard an **opportunity to augment its training under simulated combat conditions** while **freeing active TAC units for higher priority missions,** thus providing a double return on ANG training dollars.

More Speed, More Punch

USAF says **Lockheed F-104A Starfighters** made available in the near future through **deactivation of Regular squadrons may be turned over to the Air National Guard.**

While there is **nothing definite** yet on the Guard's acquisition of these Starfighters, it looks as though **aircraft conversions,** after a year's hiatus, are on **again in full swing.**

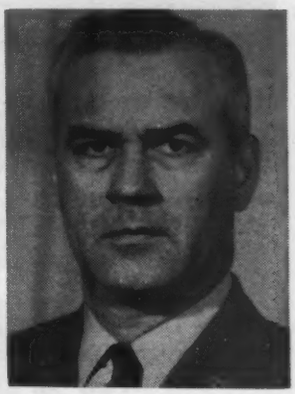
Four ANG squadrons are booked to receive **F-100Cs** in the next few months, which will **bring to seven** the number of Air Guard squadrons equipped with the **North American supersonic fighter.** The F-100s already in Guard use are A models modified to handle the **Sidewinder missile,** which qualifies them for air defense roles. The Cs are to be used in tactical fighter assignments. They're earmarked to go to the **121st Squadron of Andrews AFB, Washington, D. C.,** the **136th Squadron, Niagara Falls, N. Y.,** and the **115th and 195th Squadrons in Van Nuys, Calif.**—provided **Col. Bob Campbell,** Wing Comm.ander, and his staff can overcome noise objections at Van Nuys.

In the next eighteen months, all twelve of the Guard's **Northrop F89 squadrons** should be converted to the **F-89J Scorpion.** The **179th Fighter-Interceptor Squadron at Duluth, Minn.,** was the first to get the J; others now have Ds, Gs, or Hs. Big advantage of the J model is that it carries the **Genie air-to-air missile** which can carry a nuclear warhead. The J also has longer range.

Entry of the **Convair F-102 Delta Dagger** into the Guard has been set back to a year from now. **Hawaii's 199th Fighter-Interceptor Squadron,** now flying **F-86Ls,** will be first of three squadrons to get them.

Air Reserve, Guard Councils to Meet

AFA's **Reserve and Guard Councils** *(see December '59 "Ready Room")* have been called by their respective chairman, **Brig. Gen. Roy Sessums** of Louisiana and **Col. Bob Campbell** of California, to meet jointly in Washington **January 29-30.**



Recently named to serve under Brig. Gen. Felix Vidal, AFR deputy to Maj. Gen. Bob Eaton, Assistant Chief of Staff for Reserve Forces, were Lt. Col. Delbert J. Salmon, left, chief of operations and training division, and Col. A. E. Tokaz, who will serve as chief of personnel division.

After briefings by members of the Air Staff and major air commands, they will draw up **recommendations for AFA President Howard Markey** on future **roles and missions for the Air Reserve forces.**

NOSING AROUND . . . Brig. Gen. W. B. Keese, USAF's Deputy Director of Military Personnel, has succeeded **Maj. Gen. Bob Landry,** Assistant DCS/Personnel, on the USAF panel of the Air Reserve Forces Policy Committee. . . . Still not confirmed at this writing is the decision to move the **435th Troop Carrier Wing from Miami International to USAF's Homestead AFB,** thirty miles south of Miami. . . . Plans to move the **433d Troop Carrier Wing from Brooks AFB to Randolph** have been scrapped. . . . ANG is dickering with ADC to move its upstate New York permanent training site from **Hancock Field, Syracuse,** to **Niagara Falls Municipal Airport.** ADC is phasing out an interceptor group at Niagara Falls while it is expanding SAGE operations at Hancock. Stumbling block is that Niagara may not have enough facilities to support ANG summer training requirements. . . . **Brig. Gen. Joe Foss,** an Air Force Association National Director, has been appointed commissioner of the new **American Football League,** with headquarters in Dallas, Tex. He will still live in **Sioux Falls, S. D.,** and will continue to serve as **South Dakota ANG Chief of Staff.**—END

AFA NEWS

SQUADRON OF THE MONTH

Boise Valley, Idaho, Squadron, Cited for

great success in promoting a broad understanding of the aerospace age in the school system of Idaho through sponsorship of statewide conferences for teachers.

At Dearborn's "Helicopter Roundup," from left: Barney Stutesman of Helicopter Airways; AFA's Berge Manoogian; Ed Browalski of Ford Aerosports Club; Peter Altman, Continental Motors; Robert Van Cleave, of Helicopter Airways.

If the **Dearborn, Mich.,** Squadron's current program is successful, it might lead to nearby **Detroit's** becoming a **"helicopter city."** This was one possibility stated at a recent **"Helicopter Roundup"** by **Berge Manoogian,** a member of the Squadron which sponsored the program on October 28. Some **150 local citizens** attended the program, which had as its objective a better understanding of the role of the "chopper" in future development of the nation's large cities.

Other speakers on the program *(see cut)* included **Barney Stutesman,** chief pilot for Helicopter Airways, Inc.; **Robert Van Cleave,** general manager of Helicopter Airways; and **Dr. Peter Altman,** vice president of Continental Motors.

AFA's National President, **Howard T. Markey,** has been a busy man since he took office on September 5 in Miami Beach. He always has been active in civic affairs in his home town of Chicago. But since assuming AFA's top spot, he has been even more in **demand as a speaker** than ever, and has made a great many out-of-town trips. Here's an example of the jaunts Mr. Markey has made.

He has been to **Washington four times** on official business, (plus two or three more visits on unofficial trips), once to meet with **AF Sec'y Douglas** and also to meet **AFA's Headquarters Staff** to determine the calendar for the next year's activities; once to sit on a **special board** to discuss **Reserve officer promotions;** once to represent AFA as a head-table guest at the **annual Wright Day Memorial Dinner** on December 17; and again to represent AFA at an **AF reception** honoring Sir Dermott Boyle, Chief of Staff of Britain's **Royal Air Force.**

In October Mr. Markey was principal speaker at the luncheon featuring the **National Air Affairs Committee** meeting of the **Reserve Officers' Association** in **Las Vegas,** an appearance arranged by **Barney Rawlings** *(see cut),* who is Vice President for Air of ROA and AFA Nevada Wing Commander. Following that appearance, Mr. Markey flew to **Riverside, Calif.,** for the annual **mid-year conference of the AFA Wing there** and spoke to the group at its windup dinner in the **Mission Inn.**

In addition to a good many appearances before civic groups in **Chicago,** Mr. Markey also has addressed **Aviation Post #651, American Legion,** at which time he was honored *(see cut)* with

(Continued on page 102)

In Chicago, AFA President Howard Markey, left, accepts a Distinguished Service Award from Maj. Gen. John Gleason, past National Commander of the American Legion. In the center is Odd Meyer, Jr., the new Commander of Post #651.

In Las Vegas, where he addressed an ROA meeting, Mr. Markey, far right, with, from left: Barney Rawlings, AFA Wing Commander; Las Vegas Mayor *pro tem* Reed Whipple; MATS Lt. Gen. William Tunner; CONAC Lt. Gen. William Hall.

AMERICAN AIRLINES OFFERS

707 JETS BETWEEN NEW YORK AND CALIFORNIA

More Jet Flights to California Than Any Other Airline.

American Airlines now offers daily flights to California and Texas. To Los Angeles, there are four convenient nonstop 707 Jet Flagship flights departing from New York every day.

To San Francisco, flights daily from New York, two nonstop and one via Chicago. And rounding out American's 707 Jet Flagship transcontinental service, daily nonstop flights from New York to Dallas.

Every 707 Jet Flagship flight offers the choice of de luxe Mercury or economical Royal Coachman service. American's 707 Jets have carried more than one half million passengers and have already logged more than one billion passenger miles. The American 707 Jet Flagship—choice of America's experienced air travelers.

AMERICAN AIRLINES

America's Leading Airline

General Lance, Rep. Bennett, and Cliff Mayfield look on as Colonel Moore, who stands second from right, shows rocket hits his Group scored on remote control target in event at Jacksonville. Florida's newest AFA Squadron put on excellent program with Air Guard Group.

the presentation of the **Post's Distinguished Service Award** for his military service in two wars, his activities in the community, and his service to the Post, which he served as Commander in 1953-54. He has also made addresses before the **Rotary Club of Rockford, Ill.**, and the **Civil Air Patrol in Libertyville, Ill.**

It's been a busy four months. AFA's presidency is a demanding position, but the comments from around the country where Mr. Markey has appeared indicate that he is carrying out his responsibilities **in fine style,** and making **new friends for AFA** wherever he goes.

Last month the **Jacksonville, Fla., Squadron** cooperated with the **Air National Guard** to sponsor a **community education program** of widespread interest. **Lt. Col. Leon A. Moore, Jr.,** Commander, 125th Fighter Group, Florida ANG, was host to a **briefing** for members of the Squadron, their friends and guests, including a host of local dignitaries, during which the activities of the Group were spelled out. Colonel Moore was Air Guard host during the **1959 National Convention in Miami Beach.** He made a lot of new friends in that assignment.

Among the honored guests at the Jacksonville Airport *(see cut)* were **Rep. Charles E. Bennett,** a member of the House Armed Services Committee; **Maj. Gen. Mark V. Lance,** Florida Adjutant General; **Joe Barnett,** County Commissioner; **Msgr. Patrick E. Nolan,** a former AFA National Director; and **Lt. Col. Robert E. Nichols,** Commander, 9185th Air Reserve Group.

Cliff Mayfield, Squadron Commander, was in charge of the program. We send our congratulations on this fine effort by one of Florida's newest Squadrons.

A feature of the AFA-sponsored **World Congress of Flight** in Las Vegas last April was the **Forum of Aerospace Education Leaders,** attended by leading educators representing some **fifty-one countries,** plus a broad cross-section of **US State Superintendents of Education.** Among the latter was **D. F. Engelking,** of Idaho, who was asked to the Congress by **James M. Trail** of Boise, then AFA Board Chairman, and **Dale J. Hendry,** Commander of the Idaho Wing.

Immediately after his return, Mr. Engelking requested Trail and Hendry to arrange to have a speaker appear before a **series of preschool workshops** throughout the state to help **orient**

SATELLITE CENTER U.S.A.

This is the home of Lockheed's advanced Satellite Systems organization. It houses the 2,500 scientists, engineers, and technicians who build satellites for the Discoverer, MIDAS, and SAMOS programs of the U.S. Air Force. Here, under one 346,000-square-foot roof, is America's largest satellite center.

LOCKHEED

MISSILES & SPACE DIVISION

Idaho school teachers to the aerospace age. The program was arranged in October. **Every Idaho teacher** heard an address, complete with visual aids, by **Dr. Mervin K. Strickler,** National Director of Aviation Education for the Civil Air Patrol.

Dr. Strickler appeared at **six meetings in eight days.** He spoke to some **6,200 elementary and secondary teachers** on the possibilities, potentials, and problems facing the educational system in the dawning aerospace age. At each of the meetings he was introduced by Mr. Engelking and was accompanied by Hendry, who represented AFA.

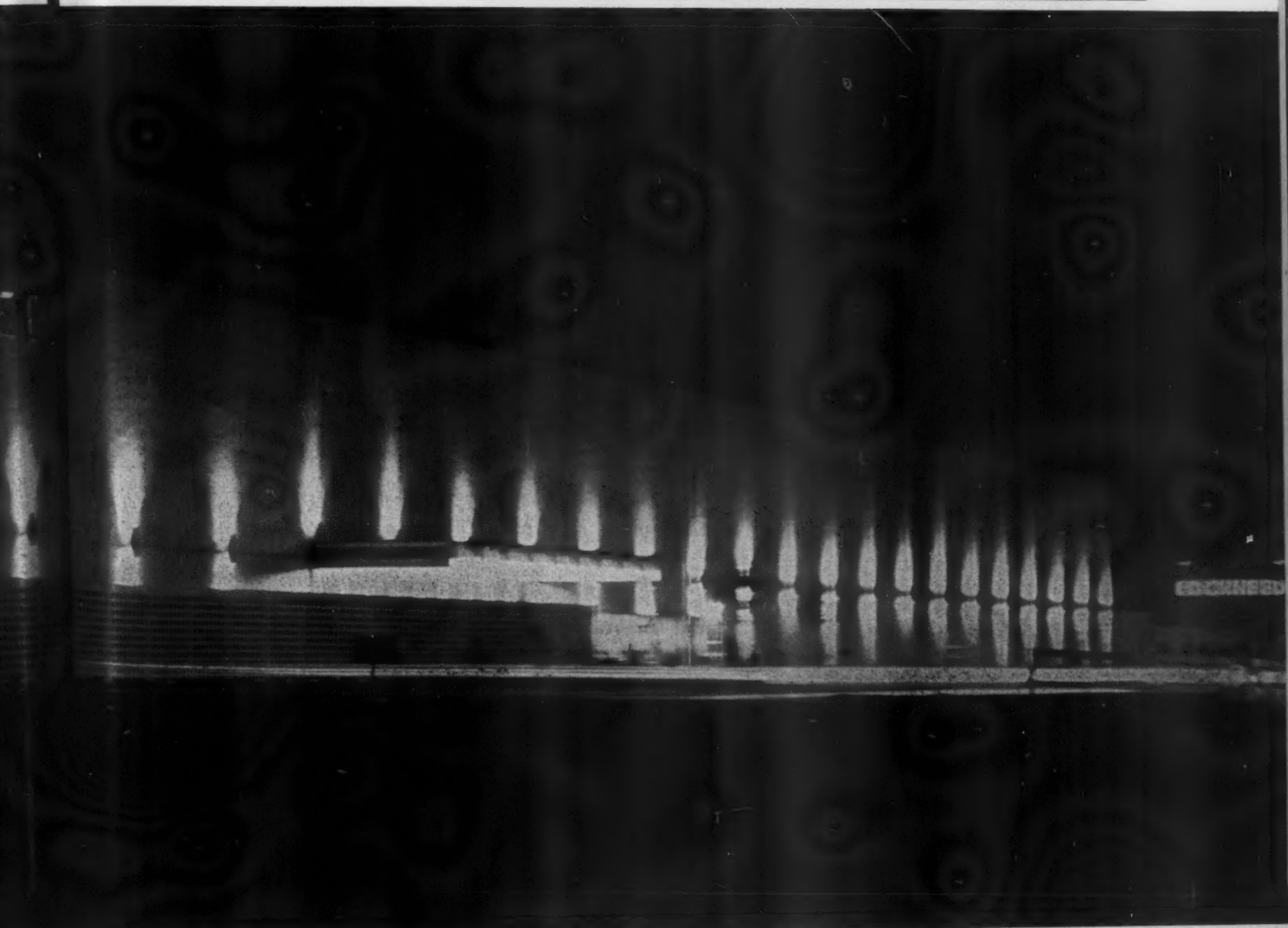
Dr. Strickler's presentation featured the **need for sound modern educational methods at all levels.** He stimulated interest and participation through the use **of films** depicting Air Research and Development Command activities. In Hendry's words, "The presentation did **more to sell aerospace education** than all our combined efforts of recent years."

AFA's cadet affiliate, **the Arnold Air Society,** has announced the formation of a **National Advisory Board** headed by **Air Force Secretary James H. Douglas** to aid the National Executive Board in carrying out the objectives of AAS. Included on the Board are several AFA leaders, including **Carl Long,** Pittsburgh, Pa., AFA's 1959 "Man of the Year"; **John B. Montgomery,** Cincinnati, Ohio, a National Director; **Tom Lanphier, Jr.,** La Jolla, Calif., past AFA President; **Frank E. Sorenson,** Lincoln, Neb., Chairman of AFA's Aerospace Education Council; and **Ruth Young,** Pittsburgh.

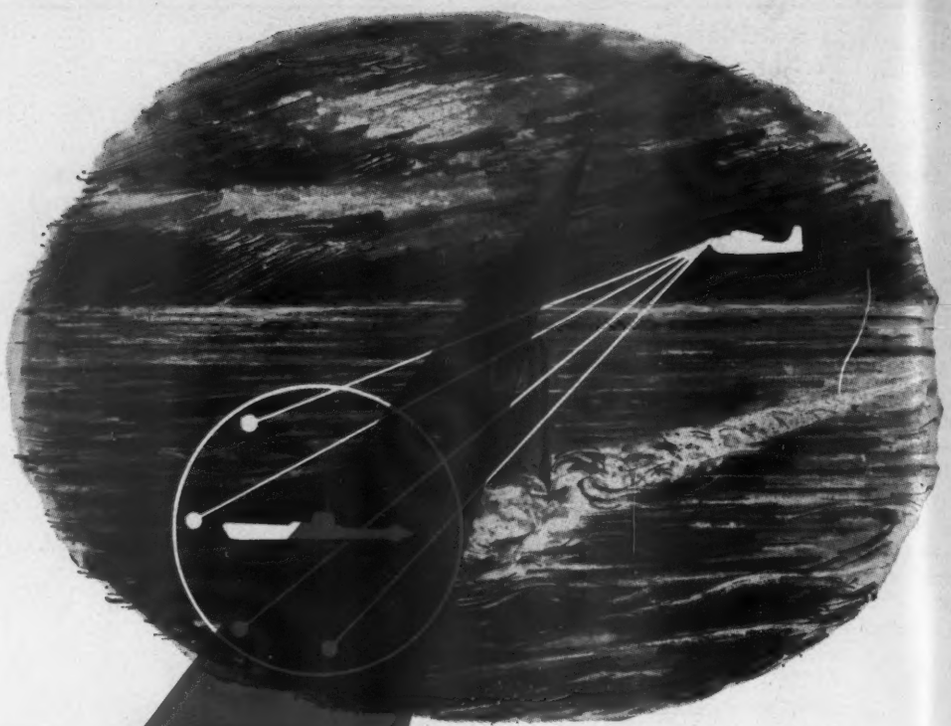
At Erie, Pa.: Erie AFA Squardon Commander Roger C. Ellis, Lt. Gen. Francis P. Griswold, SAC Vice Commander in Chief, and Congressman Carrol Kearns at dinner kicking off new Squadron's first annual Aviation Day, which featured USAF air show. General Griswold, an Erie native, was the main speaker.

AFA's **Board of Directors** missed the boat last month—but only tem-

(Continued on page 105)



Applied lessons from our ASW history



Tactics Trainers *
P2V-5
P2V-7
S2F-1
S2F-3
P5M-1
AD-5N
ZSG-4

creates experience

To date ERCO is the largest supplier of ASW tactics trainers to the U.S. Navy.*

The prime requisite in the design and ultimate construction of these units is Systems Comprehension. To its Systems Comprehension ERCO adds Human Engineering so the many subsystems that make up an ASW airborne system can be successfully integrated . . . not only for training purposes but for the mission itself.

As a result of designing the complete tactics trainer, with the overall system requirement as the criteria, ERCO has acquired the position of being an objective observer. By combining the knowledge gained through building ASW tactics trainers . . . along with our Special Purpose Computing Techniques . . . we have under development the AID (Automatic Integrated Display).

AID will make computer decisions in conjunction with an integrated display . . . thereby reducing or eliminating the operator's arithmetic functions, leaving the human mind completely free for situation analysis and tactical decision.

AID is just one of the many development programs at ERCO which have resulted from a comprehensive ASW history. Perhaps the lessons we have learned and applied so well can assist you in your current projects.

To arrange for professional discussion at your facility please contact:

ERCO

DIVISION ACF INDUSTRIES INC., RIVERDALE, MARYLAND

OTHER ACF DIVISIONS: ALBUQUERQUE • AMERICAN CAR & FOUNDRY
AVION • CARTER CARBURETOR • SHIPPERS' CAR LINE • W-K-M

AFA NEWS——CONTINUED

porarily. The Board meeting scheduled to take place aboard the Navy aircraft carrier *Independence* from December 2-5 had to be **called off** because of a **change in the ship's operational plans.** The shipboard meeting was to have taken place off the East coast, the ship's home port being **Norfolk, Va.,** with the Board sailing as **guests of the Navy and the Navy League.**

The Board now hopes to get a look at one of the Navy's newest carriers **sometime in the spring.** Meanwhile, a reciprocal program, with the **Navy League's Board of Directors** as guests of USAF and AFA at **Hq. SAC,** Omaha, Neb., is slated for January 28-29. National Director **Arthur C. Storz** of Omaha is playing a prime role in setting it up. **President Markey** will be on hand to help introduce the Navy Leaguers to the nerve center of history's **toughest global striking force.**

CROSS COUNTRY. . . . Fred Monsees, New York Wing Commander, writes that his **Wing's Convention** is scheduled for **May 14, 1960,** with sessions to be held at **Mitchel AFB.** Pass us the word on **your Wing Convention** and we'll publish it in this column . . . Northwest Region Vice President **Bob Mitchell** announces he has appointed two Wing Organization Chairmen: **Dan Plotnick,** founder and first Commander of the Anchorage Squadron, for the state of Alaska; and **Arthur Logan** of Seattle, for the state of Washington. Mitchell tells us present plans call for the organization of Wings in each state in time to have good representation in San Francisco's 1960 **National Convention. . . .** The AFA Squadron in the area encompassing **Ft. Lauderdale and Hollywood, Fla.,** has been reorganized and rechartered under the title of **"Broward County Squadron."** Commander is **Arthur Welling,** 2608 N.W. 5th Ave., Ft. Lauderdale. . . .As this issue goes to press, the first meeting of **AFA's Organizational Advisory Council** is being readied for Washington. Members of the Council, which **replaces the Wing Advisory Council,** are: **Carl Long,** Pittsburgh, Chairman; **Chip Collins,** Massachusetts; **Bob Gerlach,** Wisconsin; **Harvey McKay,** California; **Don Olson,** Colorado; **Will Ross,** Alabama; and **Marc Terziev,** New York. In addition to receiving a thorough briefing on AFA operations, the Council will spend considerable time discussing the problems referred to it as a result of a recent memo to all AFA units asking for agenda suggestions.

—GUS DUDA

APPARATUS DIVISION

TEXAS INSTRUMENTS
INCORPORATED
6000 LEMMON AVENUE • DALLAS 9, TEXAS

TI IN SURVEILLANCE SYSTEMS

U. S. Army Signal Corps Osprey AN/USD-5 Combat Reconnaissance Drone
Produced by Fairchild — Equipped with TI Surveillance Sensors

INDEX TO ADVERTISERS

ACF Industries, Inc., American Car & Foundry Div. 9
ACF Industries, Inc., ERCO Div. . . 104
Aerojet-General Corp. 26
Aeronca Aircraft Co. 114
Aircraft Radio Corp. 110
AiResearch Manufacturing Co., Div. Garrett Corp. 92
Air Transport Assn. 109
American Airlines, Inc. 101
Arma Div., American Bosch Arma Corp. . . . . Cover 2
AVCO Corp. 70
Boeing Airplane Co. 1
Cessna Aircraft Co. 18
Continental Motors Corp. 111
Convair, a Div. of General Dynamics Corp. . . . . Cover 4
Cooper Development Corp. 69
Cubic Corp. 84
Douglas Aircraft Co., Inc. 87
Electronic Communications, Inc. . Cover 3
Francis Aviation 116
General Electric Co., HMED 4
Grumman Aircraft Engineering Corp. . . . . 2 and 3
Hallicrafters Co., The 113
Hoffman Electronics Corp., Div. of Hoffman Laboratories 74
Hughes Aircraft Co. . . . . 78 and 79
Hycon Manufacturing Co. 17
Librascope, Inc. 28
Lockheed Aircraft Corp. . . . . 102 and 103
Martin Co., The 73
Martin Co., The (Denver Div.) 58
Philco Corp., G and I Div. 80
Prentice-Hall, Inc. 117
Radiation, Inc. 37
Radioplane Co., Subsidiary of Northrop Corp. 51
Raytheon Co. 25
RCA Defense Electronic Products, Radio Corp. of America 91
Saginaw Steering Gear Div., General Motors Corp. 122
Southwest Airmotive Co. 112
Sperry Gyroscope Co., Div. of Sperry Rand Corp. 44
Stavid Engineering, Inc. 83
Stromberg Carlson Co.—San Diego . . 14
Stromberg Carlson, a Div. of General Dynamics Corp. 77
Texas Instruments Incorporated 27, 105, 115, and 123
Thiokol Chemical Corp., Rocket Div. . . . . 88 and 89
Van Nostrand, D., Co., Inc. 116
Western Design, Div. of U. S. Industries, Inc. . . . . 10 and 11
Western Gear Corp. 7

A Book Review

"ATLAS: THE STORY OF A MISSILE"

REVIEWED BY COL. OTTO J. GLASSER, USAF

Atlas: The Story of a Missile, by John L. Chapman (Harper & Brothers, New York, N. Y., 1960, 224 pp., $4)

BIG ANNIE, as the Atlas ICBM has been affectionately known to her intimates, is now a respected member of the family of weapons that constitute our national defense. Her rise to respectability has been slow and difficult, and at times it appeared that she never would make it.

By the time she succeeded, the Soviets had long since announced a perfected ICBM. How could this technological race have been lost by the greatest industrial nation on earth?

The sobering lesson of John Chapman's excellent book is that engineering talent and industrial capacity are not enough. To these must be added vision, foresight, and decisive action if we are to hold our own, much less stay ahead.

The way Chapman writes it, the Atlas story is the familiar tale of the tortoise and the hare. We had the capability, we had the know-how, and we started even with the Soviet tortoise. But our long nap between 1948 and 1954 was just too much to overcome in the final sprint.

The recent years of Atlas progress form some of the brightest pages in the history of American research, development, and production programs. The earlier Atlas pages, as Chapman points out, are badly smeared and torn; they tell of opportunities lost through lack of vision in high places and of program support which came too little and (almost) too late. Had it not been for a trio of farsighted Americans—the late Professor John von Neumann, the then Assistant to the Secretary of Air Force, Trevor Gardner, and USAF Lt. Gen. Bernard A. Schriever—it is doubtful if America would have the ICBM today. It was these representatives of science, civilian government, and the uniformed military services who had the vision to recognize the impact of the thermonuclear breakthrough on the feasibility of ballistic missiles and the courage and ability to secure the support of an apathetic nation.

America can take little pride from the fact that twice in its long history of rocketry it has acquired fundamental design information which, if exploited with vision, might have significantly altered the course of events. The story of how the work of US space pioneer Robert Goddard was overlooked here, but provided the foundation for the German V-2 efforts, is well known. But the lesson was apparently not so well learned. The author goes on to describe how Project MX-774, the early US effort, led to fundamental design principles which are the cornerstones of all large ballistic missiles in use today. The higher efficiency of the swiveling engine, the lighter weight of integral tanks, the improved accuracy of the separable nose cone—all were tested on MX-774. These were radical departures and tremendous improvements over the V-2, which the United States was still busily copying. Yet progress on these great strides forward was virtually halted by budgetary pressures.

Fortunately, Convair invested enough of their corporate funds to keep this feeble spark glowing. Karel Bossart and his small team of determined engineers were kept on the job, and the idea of the ICBM was kept alive. When the lean years had passed, the spark was there to be fanned back to flame, feebly at first, but finally, under forced draft, up to white heat. The hare had awakened.

As told by Chapman, the story is largely one of people; and rightly so. For the Atlas is a stainless-steel monster; vibrant, powerful, and inanimate. But it was conceived, designed, and built by men. Without men to nurse and control it, it would never have left the launch pad. And without men to diagnose its ills and have confidence in its eventual recovery, it would have died an early and fiery death. Now its designers and nurturers have completed their tasks, but still Atlas is nothing without SAC missilemen.

It is regrettable that the author did not broaden his coverage to include the inestimably valuable contributions of even more "Atlas people." In his preface, Chapman candidly states that the story, as told here, is predominantly a Convair story, although he refers to the many fine contributions to the total effort which were made outside of Convair. It is the reader's misfortune that Mr. Chapman's contacts were limited, for the most part, to Convair and the Air Force. For when it finally got under way, the Atlas program became the finest example of government, science, and industry teamwork that this nation has ever witnessed.

Seven major prime contractors, hundreds of subcontractors, and literally thousands of Air Force officers, airmen, and civilians devoted their talents, energies, and funds to the accomplishment of the task. Government officials, civilian scientists, the Atomic Energy Commission, the Bureau of Mines, and many others were all federated in the common cause.

But if this portion of the picture is sketchy, the author makes up for it by the accuracy and vividness of the remainder. The reader will feel that he is there on the New Mexico desert as the first MX-774 leaps from its pad. His shoulders will slump when he receives the word that the program has been canceled. He will feel dejection as his nation delays and lingers over the decision to go ahead; and he will experience a surge of new hope when the decision is finally made in 1954 to reorient and accelerate the Atlas program, with an expanded team and an all-out national effort.

As he concludes, the author muses over the reasons for past delays and speculates whether proper courses of action were taken, and whether different courses might have led to the earlier attainment of the Atlas. He contrasts the conservative "wait and see" approach of the United States in the early days with the dogged, long-haul determination of the Soviets.

Now Atlas is on guard, soon to be joined by Titan, Polaris, and Minuteman. Thor is defending the ramparts of the free world from abroad. Hardly a week passes without a news story of a recent test of a ballistic missile or space vehicle. Does this mean that the lessons of MX-774 and Atlas have been learned? Or will there be future books of this type? Only time will tell, if history allows us more time.—END

The reviewer, Col. Otto J. Glasser, USAF, is currently on duty in Hq. ARDC as Chief of the Ballistic Missiles and Military Space Systems Division. With extensive background in radar and atomic weapons, he joined the Ballistic Missile Division when it was created in 1954. He became the Program Director for Atlas and later, Minuteman. He holds an engineering degree from Cornell University and an M.S. from Ohio State University.

FREE!

to new members of the AeroSpace Book Club
(Formerly Airpower Book Club)

ANY BOOK DESCRIBED ON THIS PAGE . . . values up to $12.50!

ATLAS

The Story of a Missile

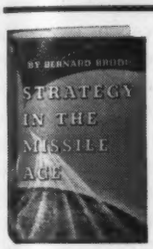
by John L. Chapman

This new selection of the AeroSpace Book Club is the full story of America's first intercontinental ballistic missile, from its beginnings to the 16,000-mile-an-hour, 6,300-mile-long leap from Cape Canaveral . . . the story of the missile selected to put the first Astronauts into orbit in Project Mercury. An inside account capturing the full excitement of the birth of the missile-space age. Must reading for all professional USAF and aerospace industry personnel.

We invite you to accept free any one of the books listed on this page . . . and to choose another book as your first selection. The value of these two books can run as high as $19.25! Yet you don't need to send in a penny with your Enrollment Form. You will be billed $4.00 for your first selection when the books arrive.

There are four AeroSpace Book Club selections a year . . . books you should read . . . you want to read. No matter how high the retail price of the book you pay only $4.00. Nothing extra for postage and handling!

Last year, club members were billed 45% less than the retail value on the books they received. You will save as much . . . perhaps more. And you will add books to your library that will inform and entertain you . . . books that you might otherwise have missed . . . books that can be invaluable in the advancement of your career.



Strategy in the Missile Age

by Bernard Brodie

Here is a balanced, objective analysis of the fundamental military problems presented by modern warfare . . . a book to stimulate thought, conversation, and action. No one who is concerned with airpower and its place in military strategy in the years ahead can afford to miss this important new book. Bookstore price $6.50.

Space Weapons

A Handbook of Military Astronautics. Compiled and edited by the Editors of AIR FORCE *Magazine*

Bookstore price $5.

A History of the United States Air Force

Alfred Goldberg, Editor

Bookstore price $6.75.

Soviet Strategy in the Nuclear Age

by Raymond L. Garthoff

Bookstore price $4.50.

The Impact of Air Power

Edited by Dr. Eugene M. Emme

Over 900 pages . . . 118 separate articles. The best and most influential thinking on airpower, written by the men instrumental in its growth—White, LeMay, Vandenberg, Mitchell, Churchill, Montgomery, etc. An invaluable addition to every airpower library! Bookstore price $12.50.

Man in Space

The USAF Program for Developing the Spacecraft Crew. Edited by Lt. Col. Kenneth F. Gantz, with a foreword by Gen. Thomas D. White, Chief of Staff, USAF

For the first time, you'll read the key findings, factors, conditions involved in the current USAF program to put man into space. Radiation . . . weightlessness . . . military impact . . . these and dozens of other topics are covered. A fascinating book, filled with vital information on spacepower! Bookstore price $4.

AEROSPACE BOOK CLUB

(Formerly Airpower Book Club)

ROOM 323, MILLS BUILDING, WASHINGTON 6, D. C.

Please enter my name as a member of the AEROSPACE BOOK CLUB to receive four selections a year. Send me the two books checked below—one as a gift, the other as my first selection. I may cancel my membership after receiving four selections; otherwise I'll receive a bonus book with each fifth selection.

- ☐ *A History of the United States Air Force*
- ☐ *Strategy in the Missile Age*
- ☐ *Soviet Strategy in the Nuclear Age*
- ☐ *The Impact of Air Power*
- ☐ *Atlas: The Story of a Missile*
- ☐ *Man in Space*
- ☐ *Space Weapons*

NAME

ADDRESS

CITY ZONE STATE

As a Club member, I am also entitled to a ten percent discount on other books I buy.

- ☐ Bill me for $4 with each selection sent
- ☐ I enclose $15 in advance for a year's membership

airman's bookshelf

Leaders and Militarists

***A History of Militarism, Civilian and Military*, by Alfred Vagts, revised edition, Greenwich Editions (Meridian Books, 1959, 542 pp., $7.50)**

Reviewed by Dr. Stefan T. Possony

This is a revised and enlarged edition of a book originally published in 1937. The author, probably the most erudite of our military historians, deals with an enormously important subject. Dr. Vagts's book deserves the closest attention of serious readers.

The author distinguishes between "military" and "militaristic." The "military way" aims at winning national conflict objectives efficiently and by deliberate reliance upon scientific procedures of decision-making and action implementation. By contrast, militarists use or abuse the armed forces to attain socio-political and even economic goals of special groups such as prestige, status, and wealth. They run military establishments according to the prescriptions of social customs, traditions, and prejudices as well as of vested interest, rank, and privilege.

Put more brutally, the militarist engages in "caste war" against the rest of the society and performs as the prime enemy of the moral and intelligent soldier. Back through history, militarists have dominated the domestic politics of many nations, acted as king-makers, and promoted each other to the summits of political power. Militaristic persons have often dictated the framing of peace treaties and hence have had a major influence on the relations among nations. Militarism has not occurred only among military officers but often has infected civilians to an even higher extent than soldiers.

Dr. Vagts traces much of this history. He starts with an analysis of the interrelationships between militarism and mass armies. Inadequate sources are available on the World War II and postwar periods, but within these limitations he has brought his story forward to the present. The period between Napoleon and World War I is treated with an amazing wealth of factual material.

The heavy concentration on nineteenth century western European history may induce the belief that the book should be read for historical interest only. In reality, by providing a close analysis of militarism, including socialist and Communist militarism, and of the historical growth of the phenomenon, the book enables the reader to gain a real insight into such perennial military problems as political infighting, service competition and propaganda, command manipulation, and unreasoned opposition to reform, new weapons, and new tactics. The historical method provides depth of understanding of these problems which must be faced, time and again, if the everlasting threat of "militarism" to real security is to be overcome.

This country has been the victim of some of the worst excrescences of militarism, and it would behoove us well to acknowledge this fact. American militarism has rarely taken the form of political meddling—which is the main reason that it has remained more or less unrecognized—but, largely in the form of traditionalism and interservice rivalry, it has functioned as a constant and paralyzing drain on American military strength. Too often in American history the world witnessed the extraordinary spectacle of US troops going into battle with equipment inferior to that in use by forces from technically less advanced countries. Dr. Vagts touches on American militarism only lightly, but his analysis of militarism as a social phenomenon has enhanced our capability to identify the evil when it occurs close to home.

Unfortunately, the author has overlooked two important qualifications to his theme. In the first place, within the American services the danger of militaristic thinking has been recognized, to some extent at any rate, and many corrective actions have been and still are being taken to curb the power of the status seekers and the self-serving protagonists of obsolescence. In other countries, too, including France and Germany, erstwhile citadels of militarism, the military have turned against the militarists. In some ways, this reaction may have gone too far in deemphasizing "militaristic-military" virtues such as firm discipline, rank prerogative, *esprit de corps*, and independence from political office holders.

In the second place, it is questionable whether the danger of "civilism" has not presently become greater than that of militarism. Civilism, or anti-militarism, distrusts the military for no better reason than prejudice and ignorance, makes political and strategic decisions without paying attention to military facts, and denies the armed forces the resources necessary to fight those wars which cannot be prevented.

The author points out that civilian incompetence is the fundamental condition in which militarism can thrive, especially in those countries where military authority is clearly subordinated to civilian leadership. But more is involved than just civilian ignorance. It is certainly questionable whether civilians ever can become militarily knowledgeable. After all, we do not expect lawyers to settle the problems of medicine. The military frequently is abused for any economic difficulties that may come along, and the security interests of democratic nations tend to be sacrificed to the delusions of tax reductions, business-as-usual, wage-increases-as-never-before, foreign-aid-to-solve-all-social-problems-globally, and the illusions of eternal peace through negotiation and international law.

The basic evil is that peacetime investments in security are thought to fetch fewer votes than demagogic attacks on "militarist" spending. At this juncture, militarism no longer is as devastating a threat to democracy as civilian irresponsibility. The crucial peril is that foolish policies render war ever more probable. If war should befall us, the chances are that free government will survive only because poorly armed and much maligned military men come to the rescue.

About the reviewer: *Dr. Stefan T. Possony is a professor of international politics at Georgetown University's graduate school. Dr. Possony is himself a recognized authority on military history and strategy. The author of* Strategic Air Power *and* A Century of Conflict, *he is a frequent contributor to* Air Force *and other magazines.*

Aerospace Books

The B-47 took off on a routine night training flight from Dyess AFB, Tex., to Denver. Four men were aboard—the regular three-man crew and an observer, Maj. Joe Maxwell. Then fire, normally disastrous for

(Continued on page 111)

PVT. ONE: Hey Sarge — *I* figured it out. You saved $13.05!

PVT. TWO: Yeah, Atlanta to Cleveland . . . 600 pounds . . . only $47.85!

PVT. ONE: And these parts will get there tomorrow — not next week!

PVT. TWO: Gee, Sarge, who put you wise to Scheduled Airlines Air Freight?*

*For military freight, always compare costs and delivery times between surface and air. Your shipments get there faster for less on the Scheduled Airlines!

THE CERTIFICATED **Scheduled Airlines** OF THE U. S. A.

AAXICO AIRLINES
ALLEGHENY AIRLINES
AMERICAN AIRLINES
BONANZA AIR LINES
BRANIFF AIRWAYS
CAPITAL AIRLINES
CENTRAL AIRLINES

CHICAGO HELICOPTER AIRWAYS
CONTINENTAL AIR LINES
DELTA AIR LINES
EASTERN AIR LINES
ELLIS AIR LINES
THE FLYING TIGER LINE
FRONTIER AIRLINES

LAKE CENTRAL AIRLINES
LOS ANGELES AIRWAYS
MACKEY AIRLINES
MOHAWK AIRLINES
NATIONAL AIRLINES
NEW YORK AIRWAYS
NORTH CENTRAL AIRLINES

NORTHEAST AIRLINES
NORTHERN CONSOLIDATED AIRLINES
NORTHWEST ORIENT AIRLINES
OZARK AIR LINES
PACIFIC AIR LINES
PACIFIC NORTHERN AIRLINES
PIEDMONT AIRLINES

RIDDLE AIR LINES
SOUTHERN AIRWAYS
TRANS-TEXAS AIRWAYS
TRANS WORLD AIRLINES
UNITED AIR LINES
WEST COAST AIRLINES
WESTERN AIR LINES

TYPE 21A ADF WEIGHS ONLY 19.7 POUNDS
Component Unit Weights: Receiver, 6.8 lbs.; Loop, 4.3 lbs.; Loop Housing, 0.5 lbs.; Indicator, 1.3 lbs.; Control Unit, 1.6 lbs.; Power Unit, 5.2 lbs.;
CAA Certificate No. 1R4-9 U.S. Military: AN/ARN-59 British Certificate of Approval VC-78

World Wide Navigation in Any Language

ARC's TYPE 21-A AUTOMATIC DIRECTION FINDER IS A DEPENDABLE NAVIGATION AID ANYWHERE

Pilots fly confidently over land or sea, in steamy tropics or frozen north, with this reliable basic navigation aid. Throughout the world there are some 60,000 transmitters to which the 21-A can be tuned. The low weight and compactness of this precision instrument make dual installations practicable even in light twins. If you plan to modernize your present radio equipment, or are purchasing a new aircraft, specify ARC's Type 21-A ADF for a long term investment in assurance and safety. Ask your ARC dealer for a quotation on the Type 21-A or any of the other ARC equipment listed below.

Dependable Airborne Electronic Equipment Since 1928

Aircraft Radio Corporation BOONTON, N. J.

ARC

OMNI/LOC RECEIVERS • MINIATURIZED AUTOMATIC DIRECTION FINDERS • COURSE DIRECTORS • LF RECEIVERS AND LOOP DIRECTION FINDERS
UHF AND VHF RECEIVERS AND TRANSMITTERS (5 TO 360 CHANNELS) • INTERPHONE AMPLIFIERS • HIGH POWERED CABIN AUDIO AMPLIFIERS
10-CHANNEL ISOLATION AMPLIFIERS • OMNIRANGE SIGNAL GENERATORS AND STANDARD COURSE CHECKERS • 900-2100 MC SIGNAL GENERATORS

fully fueled B-47, broke out in one of the engines. The pilot gave the bail order. Pilot and radarman got clear. Copilot Jim Obenauf's ejection cartridge misfired. As he set to leave the stricken plane through the escape hatch, he saw Maxwell lying unconscious. So Obenauf, with the plane liable to explode at any moment and its canopy gone after the earlier ejections, returned to the controls and brought the plane home. The dramatic, and true, story is told in *Twenty Seconds to Live*, by Elizabeth Land (Dutton, $3.25).

• • •

The Survival Book, by Dr. Paul H. Nesbitt, Alonzo Pond, and William H. Allen (Van Nostrand, $7.50), is the first complete, comprehensive civilian manual of survival under all possible climatic and geographical situations. This commercial counterpart to USAF's AFM 64-5 goes into arctic, tropic, desert, mountain, and water survival techniques, discussing climates, peoples, vegetation, animals, food, dangers, and other environmental considerations. Many charts, drawings, photos, illustrate ways of staying alive and effecting rescue.

• • •

A British party recently made headlines when the balloon by which they were attempting an Atlantic crossing disappeared. For weeks the three men and one woman were lost. They finally drifted to the Barbados Islands after a journey of some 1,200 miles by air and 1,500 by sea in their ocean-going gondola.

The story of these four at the mercy of the Atlantic appears in adventuresome detail in *The Flight of the Small World*, by two of the participants, Arnold Eiloart and Peter Elstob (Norton, $4.50).

• • •

A valuable study of future air terminal requirements is made by Maj. John E. Peterson, USAF, in *Airports for Jets* (American Society of Planning Officials, $2.50). Written originally as a master's thesis for the University of Illinois, the book analyzes new air travel trends, airspace and air corridors, jet aircraft operational characteristics, noise, measures for community-airport protection, functional peculiarities of jet airport design.

• • •

Man's first probe into space was a joint USAF-NASA venture—Pioneer I, known on the project books as Missile 130. This Thor-Able launch, which came less than a year after Sputnik I, was programmed to make a figure eight around the moon and return to earth's orbit. It climbed 71,000 miles before it fell back into the atmosphere. While it failed its prime objective, it gave this nation and the free world needed encouragement. Ted Gordon, Douglas Aircraft Company engineer and test conductor for all three of the AF moon probes, collaborates with journalist Julian Scheer to give for the first time the detailed, minute-by-minute account of the project in *First into Outer Space* (St. Martin's Press, $3.95).

• • •

New and old Arthur C. Clarke readers will be happy with the revised edition of his *The Exploration of Space* (Harper, $4.50), a classic that has stood up in the face of rapid technological progress since its first publication in 1951. Events of the past three years in the US and Russian missile and space programs are included in the revision.

Also new is a Clarke omnibus, *Across the Sea of Stars* (Harcourt, Brace, $3.95), containing two of his complete science novels *Childhood's End* and *Earthlight*, and eighteen short stories.

These two, along with his recent *The Challenge of the Spaceship* (reviewed in October '59 AIR FORCE/SPACE DIGEST) will guarantee many delightful hours of reading.

• • •

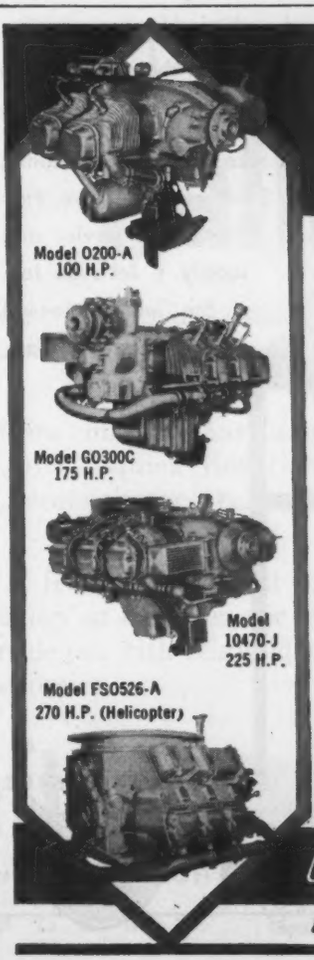
Ground transportation on the moon is the subject of German scientist-writer Hermann Oberth in *The Moon Car* (Harper, $2.95). This book represents many years of study. It explains the mechanical requirements needed for a moon vehicle, describes the special problems of fuel, low gravity, terrain, extreme temperatures. Oberth presents his design concepts, theory on construction, testing, development, and operation.

Technical and Reference Books

Advanced Propulsion Systems, edited by Morton Alperin and George P. Sutton (Pergamon, $6).

Selected Topics on Ballistics, edited by Wilbur C. Nelson (Pergamon, $10). The proceedings of the Cranz Centenary Colloquim, University of Frieburg, West Germany. AGARDograph No. 32, with foreword by Theodore von Kármán.

(Continued on following page)



CONTINENTAL AIRCRAFT ENGINES

POWER MORE UTILITY PLANES THAN ALL OTHER ENGINES COMBINED

20 MODELS—65 TO 340 HORSEPOWER

MODEL	HP	RPM	CYL.	WT.	OCTANE
A65	65	2300	4	173	80/87
C90	95	2625	4	207	80/87
O200-A	100	2750	4	190	80/87
O300-A B & C	145	2700	6	277	80/87
GO300-C	175	3200	6	312	80/87
E225	225	2650	6	363	80/87
O470-K & L	230	2600	6	404	80/87
O470-M	240	2600	6	409	91/96
O470-G	240	2600	6	432	91/96
O470-H*	240	2600	6	472	91/96
I0470-C	250	2600	6	432	91/96
I0470-D	260	2625	6	426	100/115
I0470-F	260	2625	6	426	100/130
I0470-J	225	2600	6	402	80/87
I0470-K	225	2600	6	391	100/130
FSO526-A**	270	3200	6	575	91/96
GSO526-A	340	3100	6	549	91/96

*Pusher Type engine with extended propeller shaft
**Helicopter engine

Continental Motors Corporation

AIRCRAFT ENGINE DIVISION • MUSKEGON, MICHIGAN

Fundamentals of Guided Missiles: Design, Theory, Operation, Maintenance (Aero Publishers, $12.50).

Advances in Astronautical Sciences, Vol. 4 (Plenum Press, $8). Proceedings of the Fifth Annual Meeting of the American Astronautical Society, with papers on theory and developments relative to the upper atmosphere, research, reentry mechanics, space vehicle design, guidance and instrumentation, satellite mechanics, space exploration, rockets and satellites, and man's environment in space.

The Upper Atmosphere, by Harrie S. Wilson and R. L. Boyd (Philosophical Library, $17.50). A study based on the information obtained in upper atmosphere research during the International Geophysical Year.

High Altitude and Satellite Rockets (Philosophical Library, $15). Thirteen papers dealing with peaceful uses of high-altitude rockets from a symposium sponsored by the Royal Aeronautical Society and the British Interplanetary Society at Cranfield, England, July 1957.

Sounding Rockets, by Homer E. Newell, Jr. (McGraw-Hill, $12.50). Description of modern rockets used in upper atmosphere research and what results have been accomplished by them.

Helicopters and Autogyros of the World, by Paul M. Lambermont and Anthony Pirie (Philosophical Library, $10). Technical description and details of more than 425 "choppers" of all nations.

Vistas in Astronautics, Vol. II, edited by Morton Alperin and H. F. Gregory, AFOSR (Pergamon, $15). Papers surveying scientific and technological progress in astronautics read at the Second Annual Air Force Office of Scientific Research Astronautics Symposium, Denver, Colo., 1958.

Polar Atmosphere Symposium, by R. C. Sutcliffe (Pergamon, $9.85). AGARDograph No. 29, Part I, Meteorology Section.

Basics of Missile Guidance and Space Techniques, two volumes, by Marvin Hobbs (John F. Rider, $3.90 each). Vol. I deals with principles of missile control and guidance; Vol. II surveys telemetering, space exploration by optics and electronics, satellite theory, monitoring and tracking, and space navigation.

Astronomy, by Theodore G. Mehlin (Wiley, $7.95). A general study of astronomy focusing on the solar system, what it is, where it came from, and probable existence of similar systems. Studies stars and sun, and aims for clear and logical understanding.

Space Age Dictionary, edited by Charles McLaughlin (Van Nostrand, $5.95). An illustrated general dictionary explaining in nontechnical language the basic, most needed terms and phrases in the fields of rockets, satellites and space travel.

Technology and Engineering, Vol. 2, by R. Hurst and others (Pergamon, $15).

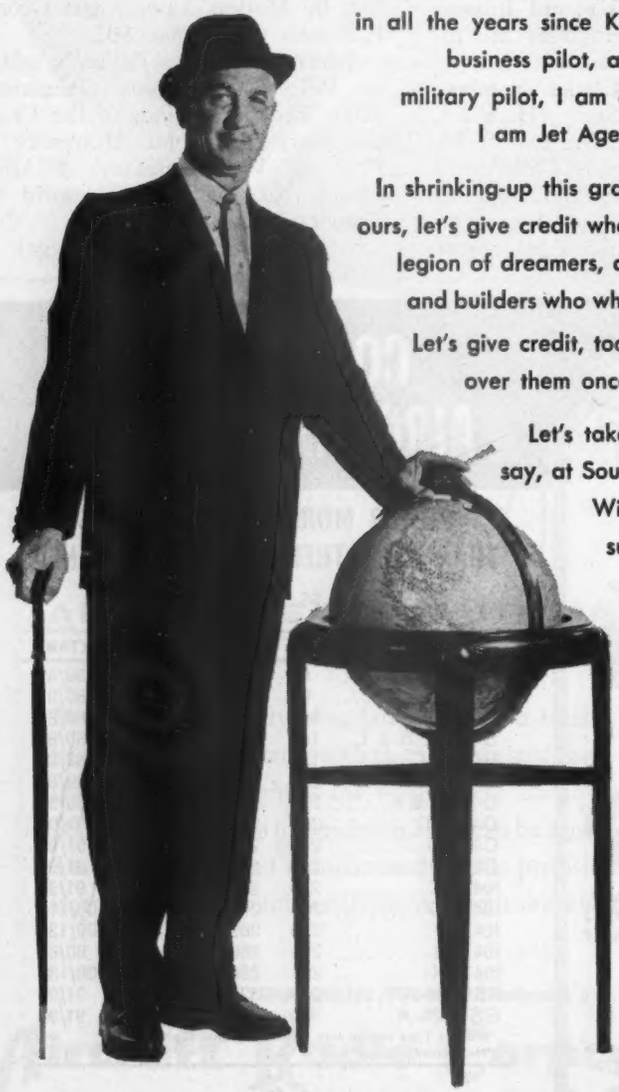
Related Reading

Three Armed Forces Staff College instructors team up to contribute a new study guide for the professional military man. *The Joint and Combined Staff Officers Manual,* by Col. Jack D. Nicholas, USAF; Col. George B. Pickett, USA; and Capt. William O. Sears, Jr., USN (Stackpole, $4.50) covers various important joint staff topics. While this one should attract all professionals, it will be of particular interest to those now in, or anticipating assignment to, joint commands.

(Continued on page 115)

FIRST IN THE JET AGE!

With Jet Age Joe, Esq.—I am a sophisticated kind of guy, who learned to fly a Jenny and now must master a Jet. I am the product of all the airmen, airplanes, engines, airports, and hours aloft in all the years since Kitty Hawk. Neither a business pilot, an airline pilot, nor a military pilot, I am a blend of all three. I am Jet Age Joe, Esq., 1960 A.D.



In shrinking-up this grapefruit of a globe of ours, let's give credit where credit is due; to a legion of dreamers, designers, researchers, and builders who whittled 'er down to size. Let's give credit, too, to those who watch over them once they've taken wing.

Let's take a look each month, say, at Southwest Airmotive, First With Jets in service and supply. I, Jet Age Joe, Esq., will be pleased to be your host.

Southwest Airmotive Co., Dallas

AIRPLANES • ENGINES • SERVICE • SUPPLY

Parts Outlets: Denver, Houston, Kansas City, St. Louis

1st with Jets

Helping to guarantee a vital "something" for a rainy day

ELECTRONIC COUNTERMEASURES

hallicrafters * QRC

The effectiveness of America's defense "umbrella"—today and tomorrow—depends on *instant availability of superior electronics weapons.*

For over seven years, the Hallicrafters company has been answering this urgent need with QRC—Quick Reaction Capability in airborne ECM, SAGE, reconnaissance, communications and missile systems.

For your electronic requirements . . . from single circuit to complete system . . . in every application on land, sea, air or space . . . Hallicrafters QRC can provide you with this unique design and production service in electronics.

ENGINEERS: Join our rapidly expanding QRC team now. For complete information address your inquiry to: William F. Frankart, Director of Engineering.

hallicrafters company

MILITARY ELECTRONICS DIVISION CHICAGO 24, ILLINOIS

URGENT PROBLEMS RELIABLY SOLVED

We produce results!

AERONCA

designs—tools—produces complex brazed stainless honeycomb structures

There is much talk in the industry about state-of-the-art capability in stainless honeycomb sandwich fabrication. Actual *production experience* in this new field of exotic materials and structures still is limited to a relatively few companies. *And Aeronca is one of them.*

At Aeronca, we have fully integrated design, tooling and production facilities in operation today. A pioneer in stainless honeycomb development, Aeronca has acquired advanced technological knowledge from proprietary R&D programs and production of components for operational air weapon systems.

The supersonic speed brake assembly illustrated below is an example of our capability. This design, one of the most intricate brazed stainless structures produced to date, is 75" long, 46½" wide and 3½" deep. Its complex cross-section required extremely precise forming and machining as well as special tooling and process control.

Whatever your honeycomb requirements, you can save time, expense and headaches by utilizing our extensive experience and facilities. Our customers will verify that *Aeronca produces results . . . not claims!*

This 120° curved section is typical missile structure.

Stainless honeycomb components for B-58 "Hustler".

Top view of new speed brake assembly.

Operational expansion has created openings for additional senior engineers. Write to W. W. Gardiner, Personnel Manager.

AERONCA

aeronca manufacturing corporation

GERMANTOWN ROAD • MIDDLETOWN, OHIO

8735-AC

Of collateral interest to this group also will be *Logistics in the National Defense*, by Rear Adm. Henry E. Eccles, USN (Stackpole, $5), a volume which relates national economy to combat force operations and explores all aspects of logistic operations, air, sea, and land.

World War II: A Literary Return

The year 1959—which marked the fifteenth anniversary of D-Day—witnessed the opening of a literary barrage of heroic proportions on World War II.

The story of "Merrill's Marauders" (the Army's 5037th Composite Unit under Brig. Gen. Frank D. Merrill) is well known—a tale of brutal, hellish combat in the jungles of Burma. But even those most familiar with it will find Charlton Ogburn, Jr.'s *The Marauders* (Harper, $4.50) a spellbinder. Ogburn, himself one of the hearty band, writes with vivid realism and authentic detail.

Absorbing is the word for David Divine's *The Nine Days of Dunkirk* (Norton, $3.95), a popular and solid historical account of this famous withdrawal—May 26, 1940 through June 3, 1940—written from Allied and German sources.

"Wars are not won by evacuations," Winston Churchill warned Commons in the second of his great "Dunkirk" speeches on the day that 338,226 men of the Allied armies had returned safely to English shores. This British Expeditionary Force had been saved by a combination of Nazi bungling, ingenious Allied strategy, disorganized unpremeditated bravery, the Royal Air Force overhead, and, on the channel surface below, 848 ships from destroyers to private fishing smacks.

The British Army lost 68,000 killed, missing, wounded, or prisoner; 2,472 guns; 63,879 motor vehicles, half a million tons of ammo; and 226 ships of all classes. The RAF lost 106 fighters, several score bombers. It was a military defeat. "But," continued Winston Churchill, "there was a victory inside this deliverance which should be noted. It was gained by the Air Force. . . . We got the Army away . . . and all our pilots have been vindicated as superior to what they (the Germans) have". . . . In the larger sense, Dunkirk proved Nazi invincibility to be the myth it was—an important spiritual victory at the time for free peoples everywhere.

Three years later the largest amphibious force in history returned to the beaches of Europe. For the story of this assault and the high-level political and military planning that made it possible we recommend *Invasion '44* by John Frayne Turner (Putnam's, $4.50).

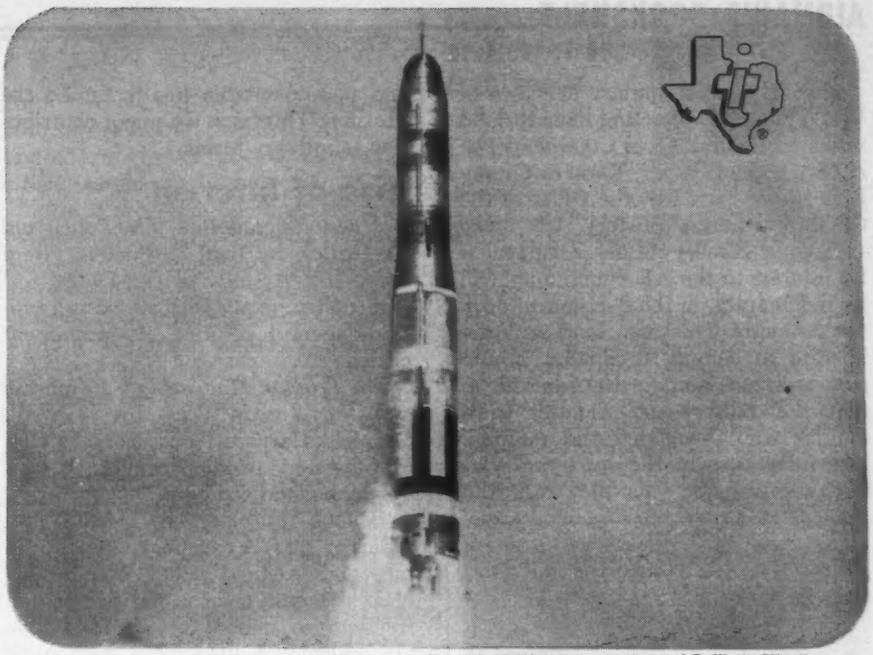
For a single account of this day, from the fighting man's point of view (Allied and German) and the French civilians who become involved, Cornelius Ryan's *The Longest Day, June 6, 1944* (Simon and Schuster, $4.95) offers the reader a memorable experience. Ryan reconstructs the day through stories, anecdotes, accounts, and personal experiences sifted from more than 3,000 survivors and 700 personal interviews. These stories he mounts against a background sleuthed from American and German war records, and he writes them in the phrase and style of action, rather than descriptive prose.

A selection of photos and color maps depicting the landings, the tactical advances, and the points at which the main characters in the book performed their missions adds much to this saga of the men on land, at sea, and in the air that fateful day. It is uniquely complementary to a similar volume, *D-Day; The Sixth of June 1944 (see "Airman's Bookshelf," May '59* AIR FORCE/SPACE DIGEST).

Another kind of war also played a key role in final victory. Its heroes were the lonely "private operators"—the cloak-and-dagger boys. James Dean Sanderson's *Behind Enemy Lines* (Van Nostrand, $4.95) reconstructs many incredible exploits in minute detail to read more like fiction than the fact it is.

The absorbing chronicle of one of World War II's most fascinating, eccentric military figures, kinsman to Lawrence of Arabia and in the words of Sir Winston Churchill "a man of genius" is now related by British author Christopher Sykes in *Orde Wingate: A Biography* (World, $6). The book, more than four years in preparation, is the scene of Wingate's wartime exploits—the Middle East, Africa, and the Far East. As leader of the fierce Chindits in the Burma Campaign and in cooperation with American air operations there under Col. Phil Cochran, Wingate salvaged this key nation for the Allies. This mystic man of force and intellect, a proud product and hero of the British Empire, is buried in Arlington National Cemetery with the crew of an American airplane. The tragic air crash in 1944 cut short a magnificent life at the age of forty-one. •

(Continued on following page)


Martin's TITAN Intercontinental Ballistic Missile

TI PROGRAMMERS
in Missile Systems

TEXAS INSTRUMENTS
INCORPORATED
6000 LEMMON AVENUE • DALLAS 9, TEXAS

APPARATUS DIVISION

Twenty crucial military decisions of World War II, affecting mostly land warfare, are studied in *Command Decisions,* edited by Dr. Kent R. Greenfield and prepared by the Office of the Chief of Military History, US Army (Harcourt, Brace, $5.95). Of particular interest to the AF community will be the chapter on the decision to drop the A-bomb. This one, long and deliberate in coming to finality, found pros and cons among the Administration, the military and scientific community who developed the weapon. The reluctance of the Japanese warlords to surrender when they knew the end was inevitable finally forced the decision. This book is a major contribution to military history.

Also of Interest

Massive Retaliation: The Policy and Its Critics, by Paul L. Peeters (Regnery, $5). A study of the Dulles foreign policy, explaining its many ramifications and refuting its prominent critics.

The Truman-MacArthur Controversy and the Korean War, by John W. Spanier (Harvard Univ. Press, $6.50). Step-by-step inside account of this epic command struggle.

Beyond Survival, by Max Ways (Harper, $4). A case for national military and political policy based on a clear recognition of moral values and freedom to choose objectives which are realistic. A plea for a long-range "national purpose."

Men and Atoms, by William Lawrence (Simon and Schuster, $5.95). An account of the discovery, uses, and the future of atomic energy by a Pulitzer Prize winner and scientific writer for the New York *Times.*

United States Government Organization Manual, 1959-1960 (Government Printing Office, Supt. of Documents, $1.50).

Impatient Giant—Red China Today, by Gerald Clark (David McKay, $4.95). A foreign correspondent warns that within ten years the world's eyes will shift from Moscow to Peking.

Four new volumes have appeared in the monumental University of Michigan Press's proposed fifteen-volume "History of the Modern World," edited by Allan Nevins and Howard M. Ehrmann: *France: A Modern History,* by Albert Guerard ($8.75); *Italy: A Modern History,* by Denis Mack Smith ($7.50); *The United States to 1865,* by Michael Kraus ($7.50); and *The United States Since 1865,* by Foster Rhea Dulles ($7.50). The authors, distinguished in their fields, write with sweep, depth, color, and clarity, and combine political, social, and cultural history.

For Youngsters and Others

The Story of the U. S. Air Force, by Robert Loomis (a Landmark, Random House book, $1.95). History of the USAF written in terms of the record, the heroes, and the leaders who have pioneered the conquest of air and space. Foreword by Gen. Curtis E. LeMay.

Jet Pilot Overseas, by Henry Lent (Macmillan, $3). The story of a newly commissioned USAF lieutenant in his first combat assignment after flying school—TAC's First Fighter Wing at Morón Air Base, Spain.

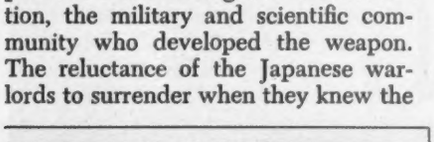
Sky Sentry: A SAC Crewman in Service, by Arnold Brophy (Dodd, Mead, $2.75). Photo-narrative story of SAC told through the activities and personal experiences of a SAC B-52 combat crewman.

New Dimensions of Flight, by Lewis Zarem (Dutton, $3.95). Picture-narrative coverage of all types of USAF operational, research, experimental aircraft, missiles, and space vehicles; the research and development in man in space and discussion of basic principles and disciplines of astronautics.

General Billy Mitchell, by Helen Woodward (Duell, Sloan & Pearce, $3.50). Biography of the famous airpower pioneer.

Wings for Peace, by M. Talmadge and I. Gilmore (Dodd, Mead, $3). Novel of training, life, and experiences at the Air Force Academy.

Men, Planets and Stars, by Clyde B. Clason (Putnam, $2.95). Study of astronomy, its major developments and the people who devoted their lives to it.



Conventional Jet

I.F.R. HOOD

The Modern Method of Simulated Instrument Flight for Conventional or Jet Type Aircraft $15.00

FRANCIS AVIATION

Box 299 Lansing, Mich.

SPACE FLIGHT

Volume I:

ENVIRONMENT AND CELESTIAL MECHANICS

By Krafft A. Ehricke

Program Director, Centaur and Vega Program, Convair-Astronautics

LATEST IN
"Principles of Guided Missile Design" Series
Grayson Merrill, General Editor

Covers the concepts of space flight, its environment, astronomy from the viewpoint of the astronautical engineer, and principles and methods of celestial mechanics. Comprehensive data tables, graphs, many derivations and equations of notion are helpfully included.

650 pages, about $15.00

—COMING SOON—

Volume II: Dynamics
Volume III: Operations

VAN NOSTRAND

PRINCETON, N. J.

CANCER'S DANGER SIGNALS CAN BE SAFETY SIGNALS

You can do two things to guard yourself against cancer: Have an annual health checkup. Alert yourself to the seven danger signals that could mean cancer: 1. Unusual bleeding or discharge. 2. A lump or thickening in the breast or elsewhere. 3. A sore that does not heal. 4. Change in bowel or bladder habits. 5. Hoarseness or cough. 6. Indigestion or difficulty in swallowing. 7. Change in a wart or mole. If your signal lasts longer than two weeks, go to your physician. Give him the chance to give you the chance of a lifetime.

AMERICAN CANCER SOCIETY®

CONTINUED

Falcons to the Fight, by Joe Archibald (Macrae Smith, $2.95). Sports novel about the USAF Academy football team.

Sabre Jet Ace, by Charles Coombs (Wheeler, $2.20). Dramatic story of Capt. Joseph McConnell, Jr., USAF triple-jet ace in the Korean War.

Our Space Age Jets, by C. B. Colby (Coward-McCann, $2). First-line AF and Navy combat jet aircraft in photo, narrative, three-view silhouettes, and statistical rundown.

Transport Planes That Made History, by David C. Cooke (Putnam, $2.50). Picture story of US military and civilian transport aviation from 1921 to present.

Jet Navigator, by R. Montgomery and Lt. Col. Grover Heiman, USAF (Dodd, Mead, $3). Novel featuring life and duty of an AF navigator in SAC.

The Story of Flight: From Ancient Winged Gods to the Age of Space, by John Lewellen and Irwin Shapiro (Golden Press, $3.95). A beautifully illustrated history that is comprehensive, informative, educational.

Wings over Alaska: The Story of Carl Ben Eielson, by Edward A. Herron (Messner, $2.95). Biography of pioneer airman who opened Alaska to air travel.

Knights of the Air, by John Norman Harris (St. Martin's Press, $2.75). Personalized stories of World War I aces and their role in the first war in the air.

The Wonderful World of the Air, by James Fisher (Doubleday, $2.95). Attractively illustrated discussion of the origins, effects, and uses of the atmosphere, with special emphasis on the history of flight.

Weather in Your Life, by Irving Adler (Putnam, $3). Clear, simplified story of meteorology touching on all aspects of weather, storms, clouds, air movements, etc.

Leap into Danger, by Leif Hamre (Harcourt, Brace, $2.95). Two Norwegian AF officers struggle to survive and be rescued in the frozen mountains of north Norway.

Steve Canyon: Operation Foo Ling; Steve Canyon: Operation Eel Island; Steve Canyon: Operation Convoy; Steve Canyon: Operation Snowflower. All by Milton Caniff (Grosset & Dunlap, $1.50 each). The extension of Steve Canyon to the juvenile audience proves high and fast reading adventure. All are in an enigmatic Far East setting.

The Royal Air Force, by William McStay (Muller, $2.75). A history.

Rescue from the Air, by Michael Gibson (Abelard-Schuman, $3). Dramatic stories about USAF Air Rescue Service and its British counterpart, British Search and Rescue.

Leslie Takes the Skyroad, by Pat O'Malley and Mary Walfrieda (Dodd, Mead, $3). Authentic story about airline stewardesses in jet flight.

Crash Landing! by Don Stanford (Funk & Wagnalls, $2.95). Thrilling sports and flying novel.

Aviation from the Ground Up, by J. J. Floherty (Lippincott, $3). New revised edition.

Medical Science and Space Travel, by W. A. Kinney (Watts, $3.95). Authentic illustrated story of space medical science today and how it is preparing man for survival in space.

Rockets and Satellites Work Like This, by John W. R. Taylor (Roy, $2.75). Rocketry from ancient Chinese to now, with explanation of propulsion, guidance, construction, and actual test.

Off into Space: Science for Young Space Travelers, by Margaret O. Hyde (Whittlesey House, $2.50).

Rocket to the Stars, by Lee Priestly (Messner, $2.95). Novel about a sixteen-year-old girl who lives on a top-secret missile base, and shares the responsibility of the work going on there.

Moon Base, by W. Nephew and M. Chester (Putnam, $2.75). Illustrated story of manned conquest of the moon.

Satellites and Space Probes, by Erik Bergaust (Putnam, $2.50). Summary in photo narrative of recent space explorations.

Window in the Sky: The Story of Our Upper Atmosphere, by Homer E. Newell, Jr. (McGraw-Hill, $3). Discusses troposphere, stratosphere, mesosphere, and exosphere.

Handbook for Space Travelers, by Walter B. Hendrickson (Bobbs-Merrill, $3.95). A guide for future space travelers.

Rocketry through the Ages, by Don Cox and Michael Stoiko (Winston, $2.95). Illustrated narrative story of rockets from early days to present.

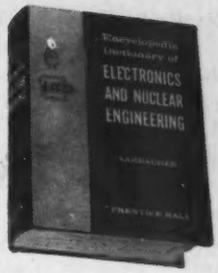
The Sky Is Our Window, by Terry Maloney (Sterling, $3.95). Explains the universe, life on other planets, and man's chance of reaching and living in other worlds.

The Moon, by George Gamow (Abelard-Schuman, $2.75). New updated edition with introduction by Harold C. Urey, Nobel Prize winner.

Boy's Book of Astronomy, by Patrick Moore (Roy, $3). History of astronomy, description of the planets, stars, comets, and speculation about conquest of space.

—MAJ. JAMES F. SUNDERMAN, USAF

ENCYCLOPEDIC DICTIONARY OF ELECTRONICS AND NUCLEAR ENGINEERING



by Dr. ROBERT I. SARBACHER, student of Albert Einstein, Consultant to Armed Forces and private industry

This giant, new reference book places immediately under the user's hand for the first time, the "standard" definitions of ALL official technical societies, pinpointing scientific terminology beyond dispute, misinterpretation or error.

Over 14,000 entries are presented . . . clear, compact explanations of ALL terms in electronics and nuclear engineering that make complex concepts and devices readily understandable . . . 17,000 idea stimulating feed-outs from basic entries to related data . . . 1,400 schematic drawings . . . ALL sanctioned Armed Forces terms, abbreviations, military establishments with electronic and nuclear operations. Here is what's been done, what's available, grouped for ready comparison. Information is provided for associated fields, recently de-classified material included, equations, tables, et al. 1,417 pages, 1,000,000 words. *Speed your operation with this leap ahead in scientific knowledge!* *$35.00*

GUIDE TO THE SPACE AGE

by BESSERER & BESSERER

For the first time a wide scope, SIMPLIFIED space glossary. Covers missilery, rocketry, astronautics, astronomy, meteorology, measurement, abbreviations, space jargon, et al. Over 5000 entries are presented in alphabetized arrangement for instant access. Definitions are short, simplified, directly to the point (not strung out complexly over a series of pages). All explanations are as non-technical as practicable — ideal for single-area specialists who need to know terms, techniques, and jargon of related areas.

Standardization and preciseness of terminology eliminate inaccuracy, variations and uncertainty—provide effective, definitive space age communication. New meanings, new developments, and latest interpretations are placed at reader's fingertips. Authoritativeness is insured by background of authors, such as service with Bendix Aviation, Ramo-Wooldridge, Space Technology Laboratories, Applied Physics Laboratory of Johns Hopkins University, etc., plus development engineering on TITAN and TALOS missiles, MINUTEMAN, Project BUMBLEBEE, plus exhaustive research on both American and foreign space science literature. *332 pages.* *$7.95*

Prentice-Hall, Inc.
Englewood Cliffs, N. J.

Please send me, for 10 day FREE examination, the book(s) I have marked below. I will either send you my payment covering the prices listed, plus a few cents postage, or return the books to you and pay nothing.

☐ Encyclopedic Dictionary of Electronics and Nuclear Engineering $35.00

☐ Guide To The Space Age $7.95

Name .....

Address .....

City..... Zone.... State.....

(SAVE! If check with order, we pay postage.) CEK-EG-68

CHECK ONE	YES	NO
Do you make monthly payments on a car?	●	●
Do you make monthly payments on your home?	●	●
Have you got money put aside for your children's education?	●	●
Have you got enough money in the bank to absorb the financial shock of a temporary grounding?	●	●
Could you live as well as you do now *without* flight pay?	●	●

If you answer "no" to any one of these questions, you almost certainly could benefit from AFA's low-cost Flight Pay Insurance.

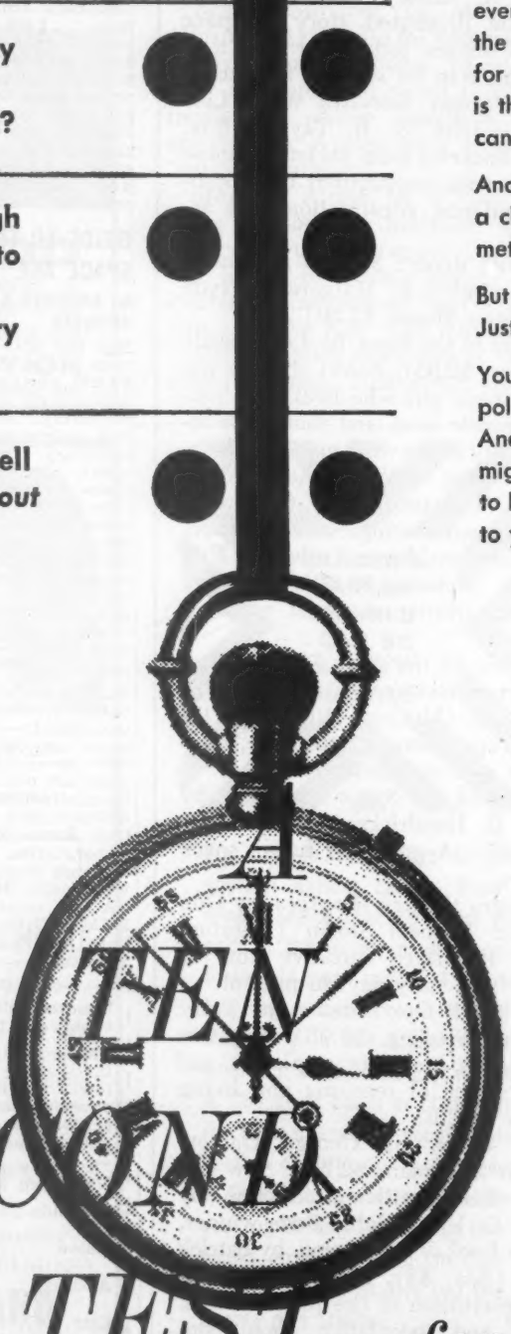
But at any rate, you should act right now to get full information on the plan . . . which you can do almost effortlessly.

Just fill in the blank below . . . and you'll get the actual policy that will protect you. You can check for yourself every detail of your coverage . . . consider the policy from every angle . . . find out for yourself why Flight Pay Protection is the best insurance buy rated personnel can make—*before you send us a cent.*

And for your convenience you have a choice of premium payment methods (see application).

But you get the same benefits either way. Just indicate the method you prefer—

You'll find some of the benefits this policy offers you on the facing page. And you'll find all the ground rules that might bar payment of a claim too, just to be fair. Most of them will never apply to you, but you should know about them.



TEN SECOND TEST *for rated personnel*

CHECK THESE BENEFITS:

Your protection starts at the end of the month in which you make application.

You are indemnified for 80% of lost flight pay taxfree (about equivalent to 100% of your regular taxable flight pay) if you're grounded for accident or disease.

Payments continue for 12 months if your grounding is due to disease or ordinary accident.

You are paid for up to 24 months, if your grounding is the result of an aviation accident.

Indemnities for 3 months' back pay reach you in your first check.

Payment for a single 90-day grounding reimburses for you the whole cost of 10 years' protection

Maybe you're certain that you're not going to get sick in the next ten years—but remember! Flight Pay Protection covers you for ordinary accidents, too. If you're in a traffic accident—if you trip on the way to the flight line, or fall off a ladder at home, and lose flight pay as a result—*your Protection Plan pays off.*

No matter how healthy you are, *this accident feature alone is worth the whole cost of your Flight Pay Protection Program.*

NOTE

There are some conditions and exclusions that affect your coverage under the Flight Pay Protection Plan. They are designed primarily to protect your investment in the Plan—restrictions that you'd normally expect.

For instance, you're not indemnified for illness or accidents which originate before the effective date of your coverage. Your coverage for accidents begins with the effective date of your policy. Your coverage for illness starts 30 days *after* the effective date of your policy. All policies become effective on the last day of the month in which the application is postmarked.

To be eligible for protection, you must have passed your last annual physical . . . be presently on flying status . . . and be a member of the Air Force Association.

Most claims are routine. Where a difference of opinion exists, the Air Force Association has the right to request a review of medical records and other claim evidence by appropriate medical authorities normally the Office of the Surgeon General, USAF.

There are some other specific exclusions, covering groundings due to insanity, court-martial, attempted suicide, etc.; here they are in detail:

EXCLUSIONS

The insurance under the policy shall not cover loss to any Member resulting in whole or in part from or due to any of the following:

1. Criminal act of the Member or from injuries occasioned or occurring while in a state of insanity (temporary or otherwise).
2. "Fear of flying," as officially certified by responsible authority of the Member's Service and approved by the head of the Service in accordance with applicable regulations.
3. Caused by intentional self-injury, attempted suicide, criminal assault committed by the Member, or fighting, except in self-defense.
4. Directly or indirectly caused by war, whether declared or not, if act of an enemy in such war is the direct cause of loss insured hereunder, hostile action, civil war, invasion, or the resulting civil commotions or riots.
5. Failure to meet flying proficiency standards as established by the Member's Service unless caused by or aggravated by or attributed to disease or injuries.
6. Inability of a member to continue to meet physical standards for Hazardous Flight Duty because of a revision in those standards, rather than because of preceding injury or disease causing a change in the physical condition of such member.
7. Accidents caused while riding or driving in any kind of race.
8. Alcohol, drugs, venereal disease, arrest or confinement.
9. Willful violation of flying regulations resulting in suspension from flying as a punitive measure, or as adjudged by responsible authority of the Member's Service.
10. Sentence to dismissal from the service by a general court-martial, submitted resignation for the good of the service, or suspension from flying for administrative reasons not due to injuries or disease.
11. Loss of life shall not be deemed as loss for purposes of this insurance.
12. Primary duty requiring parachute jumping.
13. Voluntary suspension from flying.
14. A disease or disability pre-existing the effective date of coverage, or a recurrence of such disease or disability, whether or not a waiver has been authorized by appropriate medical authority in accordance with regulations or directives of the service concerned.
15. Mental or nervous disorders.

SEND NO MONEY NOW . . . JUST RETURN THIS APPLICATION TODAY!

AFA FLIGHT PAY PROTECTION PLAN

AIR FORCE ASSOCIATION • MILLS BLDG. • WASHINGTON 6, D.C.

1-60

Send me my Flight Pay Protection Policy.

Bill me for:

$_____ semi-annual premium (1% of annual flight pay, plus $1 service charge)

$_____ for full payment of annual premium (2% of annual flight pay)

I enclose:

$_____ semi-annual premium (1% of annual flight pay, plus $1 service charge) Bill me every 6 months.

$_____ in full payment of annual premium (2% of annual flight pay)

This insurance is available for AFA Members only ☐ I am an AFA member ☐ I enclose $6 for annual AFA membership

Rank (please print) Name Address

City Zone State $ Annual Flight Pay Years Service for Pay Purposes

I understand the conditions and exclusions governing AFA's Flight Pay Protection Plan, and I certify that I am currently on flying status and entitled to receive incentive pay and that to the best of my knowledge I am in good health, and no action is pending to remove me from flying status for failure to meet physical standards. I authorize AFA, or AFA representatives, to examine all medical records pertinent to any claim I may submit.

Signature of Applicant Date

USAF's historians turn out a broad range of products, including studies of German Luftwaffe operations in World War II. Here historians Joseph Angell, Col. W. A. Hammer discuss problem with German General Plocher.

In war or peace, such varied items as wristwatches and tax refunds fall within the purview of the servicewide band of Air Force historians who serve the nation by . . .

KEEPING THE RECORD STRAIGHT

Mary Finch Tanham

ITEM. A youthful pilot, shot down in World War II in occupied France, gives his wristwatch to a Norman farmer who helps him make contact with the underground. Through the underground, he gets back to England safely.

After the war, the farmer wants to return the gift. The State Department turns the matter over to the Air Force, service historians dig into their files, and voilà! the watch comes home to its initial owner on this side of the Atlantic.

Item. A number of aircraft companies bring suit against the government for $150 million in World War II tax refunds. The Internal Revenue Service calls on the Air Force, whose historical records turn up a remarkably full accounting on wartime procurement and production. Not all of these cases have been settled yet, but, aided by USAF's figures, IRS and the concerns have been able to unravel a good number of them.

These two dissimilar instances point up the range of very real, day-to-day contributions made by an Air Force-wide band of men and women charged with setting down service history while it's hot. Civilians and uniformed personnel, they pound away at their typewriters through war and peace, crisis and routine, budget cut and force buildup.

Numbered in their continuing historical output are accounts of obscure operations written in the field, top-level Pentagon reports, major policy and strategy studies undertaken at Air University, and running records of major command activities.

At the head of the program, which dates to 1942, is the Historical Division of the Research Studies Institute, Air University. Division chief is Dr. Albert F. Simpson, whose main offices are at the university, Maxwell AFB, Ala. The Air Force Historical Archives, which contain 2,000 file cases of data, are also maintained there.

The USAF Historical Division prepares a wide variety of products. It circulates some 100,000 documents a year. Seven volumes of its *The Army Air Forces in World War II* have appeared. Division historians under Dr. Alfred Goldberg two years ago turned out a much-needed single-volume general history of the Air Force, *A History of the United States Air Force, 1907-1957*. It first appeared in the August 1957 issue of AIR FORCE Magazine, which marked the Air Force's Fiftieth Anniversary.

Division historians have in recent years prepared approximately 125 vitally important monographs for planners and programmers. Subjects have included, "USAF Operations in the Korean Conflict," "The Development of Tactical Air Doctrine," and "Legislative History of the AAF and USAF."

Profiting from the experiences of the defeated German Air Force as

S/Sgt. Hollis J. McCarty, 2d Air Division historian at Dhahran, Saudi Arabia, receives a lesson in local history.

SAC Commander Gen. Thomas S. Power, right, holds secret document on B-52 with his chief historian, John T. Bohn.

well as from our own record of victory, the Division has supervised the preparation, translation, and publication of papers written by the highest-ranking German Luftwaffe commanders. Printer's ink is scarcely dry at present on *Historical Turning Points in the German Air Force War Efforts,* a study based on the original work of German Field Marshal Kesselring, and *The German Air Force General Staff.* Another, entitled *Russian Air Force As Seen Through the Eyes of German Commanders,* will be in circulation soon.

For the benefit of officers and airmen, as well as for the veteran with tendencies for Monday morning quarterbacking, Air University historians have prepared close to 900 brief official histories of active and inactive Air Force units. These are not dusty pamphlets of dry facts and figures, but interesting, compact reading.

The lineage history of the *Bloody Hundredth,* the 100th Bomb Group of the Eighth Air Force, for example, contains a stirring account of the "stubbornly determined crews who pushed their B-17s through a seemingly endless stream of German fighters and endless miles of flak to the vitally important industrial targets and airfields on the European continent." This work includes the capsule story of the bloody and famed Regensburg-Schweinfurt mission.

The First Fighter Group, in another such history, has been traced back to its inception in 1918, citing its squadrons, stations, commanders, campaigns, decorations, insignia, and heroes. World War I's "Ace of Aces," Capt. Edward V. Rickenbacker, was a squadron member.

Publications are distributed through the archives office under Miss Marguerite K. Kennedy. Requests should be addressed to her, Historical Division, Research Studies Institute, Air University, Maxwell AFB, Ala.

The division maintains a liaison office in the Pentagon. This is charged with important projects for and in conjunction with USAF Headquarters. In addition, it maintains close working contacts with the historical programs of the major commands.

These Pentagon historians constantly sift through and boil down multitudinous masses of records, documents, and interviews. From this brew they write annual Headquarters histories and prepare the Annual Report of the Secretary of the Air Force, top Air Force document published.

They also concentrate on brief, narrative monographs of immediate interest for immediate use by the Air Staff.

"These are historical tools of management and command," says Joseph W. Angell, Chief of the Air University Historical Liaison Office, who may be asked at any moment by Pentagon policy-makers to drop everything for extraordinary assignments or special studies.

In the past few months, this office has summarized "brink of war" areas of the world for the Director of Plans. A special history was drawn up on the Office of DCS/Operations for Gen. Dean C. Strother, Deputy Chief of Staff, Operations. More recently, for pending decisions by the Office of the Chief of Staff, historians crashed through with a detailed analysis of stops and starts in the development of selected aircraft.

The Air Force's entry into the nuclear and aerospace age is covered, on a full-time basis, by historians in key directorates in the Pentagon. They record the continuing progress of the ballistic missile and space programs.

The global field programs of the major commands, which are guided and supported by the Historical Division, are vast endeavors in themselves.

Gen. Dean C. Strother, DCS/Ops, and historian Dr. Alfred Goldberg confer over a new project at the Pentagon.

At Hq. Air Materiel Command, for example, full-scale histories from twenty-one AMC field areas and headquarters, plus 223 special studies relative to procurement and management, and 8,000 periodically screened documents, are available in one place for research.

This command was probably first to develop the continuing technique used for writing history throughout the Air Force, and its historical files are constantly tapped for information by the entire Air Force, Congress, industry, and other agencies.

Here, at Wright-Patterson AFB, Ohio, are the histories of spark plugs and beryllium, "The Voodoo (F-101) Story," the "History of the Heavy Press Program," and the "Air Force Industrial Production Readiness Concept" study. Management control and civilian personnel management have also been thoroughly explored by AMC historians. Here, also, are the facts to use in developing estimates of logistic support requirements for space vehicles of the future.

AMC's practical, specific "case studies" are highly regarded and often used by congressional committees. Ex-

(Continued on page 123)

JET ENGINE SUPPRESSOR

WITHSTANDS SUPERSONIC SHOCK

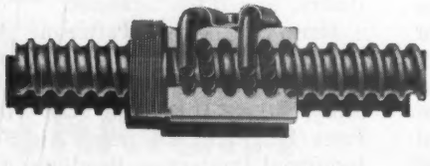
BUTTRESSED BY THE Saginaw b/b Screw

Suppressor in use behind an Air Force F-86 H "Sabrejet"

Muting the ear-shattering roar of a jet engine on pre-flight "run-ups" is the job of Koppers Company, Inc.'s new Portable Run-Up Suppressor. And four Saginaw Ball Bearing Screws—flanking the body of the Suppressor—help hold it rock-steady against the full force of the jet engine's supersonic blast!

These Saginaw b/b Screws enable the Suppressor to be hand-raised or lowered into position faster and with far less effort than by any other manual means. The reason? The Saginaw b/b Screw converts *rotary* motion into *linear* motion with over 90% *efficiency!* And the dependable Saginaw Screw also played a significant part in keeping the Suppressor both light in weight and portable in design.

Whether you manufacture miniature electronic controls or giant production equipment, the Saginaw b/b Screw may be able to give *your* products that valuable **S**ales **A**ppeal you're looking for. To discover all the benefits it can bring you, write or telephone Saginaw Steering Gear Division, General Motors Corporation, Saginaw, Michigan—*world's largest producers of b/b screws and splines.*



Give your products NEW SALES APPEAL... switch to the Saginaw

WORLD'S MOST EFFICIENT ACTUATION DEVICE

ball bearing Screw

amples are works on missiles, planes, and engines in the current inventory.

If "management tools" are found in these historical files at AMC, a full set of "operational tools" are found in the files at the Strategic Air Command. Historians are assigned at each echelon of SAC.

Headquarters history personnel fit together for the record the individual, and often isolated, pieces of SAC's worldwide program. Because they are always current, historians can come up with answers quickly for commanders with limited reading time.

Current SAC concepts, along with the problems of dispersal and hardening, have been thoroughly documented in a new, comprehensive *History of SAC*. Its chapters also include coverage of SAC's mission and structure, its missile program, and communications.

Special studies conducted at SAC's Offutt AFB, Neb., Headquarters scrutinize the problems of B-52 conversion and SAC aircraft maintenance. The latter not only benefits SAC units, but has been distributed throughout other commands concerned. Among other government and private agencies to use this historical material have been Boeing, Convair, RAND, and the Stanford Research Institute.

History also plays a prime role at other headquarters throughout the Air Force. At ARDC, where three-fourths of the historians are Ph. D.s, today's breathtaking technological advances are recorded.

Besides supervising the history programs of its diverse centers, ARDC Headquarters historians pick timely topics and "large themes" for study. A retrospective look at all phases of the X-2 test vehicle crash three years ago and an analysis of the programs connected with dropping atom bombs from airplanes have been among them.

Tactical Air Command historians at Langley AFB, Va., are currently interpreting reports and records on brush-fire crises in the Pacific and Middle East areas in the recent past. They have just completed an important study titled "Composite Air Strike Force."

At CONAC Headquarters, Mitchel AFB, N.Y., where historians assist in preparing certain Air Force Reserve manuals, the historical office "advertises" for the Reserve program: "Don't get around much anymore? You can! Visit your units without leaving the building by borrowing the latest history from the historical office."

At Hq. US Air Forces in Europe, historians some time ago prepared a study on the "Berlin Air Corridor" so significant that Gen. Frank F. Everest, who was then USAFE commander, directed that a copy be flown immediately to Secretary of the Air Force James H. Douglas, who was in Spain on an inspection visit.

This same office was handed the delicate task of naming the new Air Force hotels in Wiesbaden, Germany, without disrupting German-American community relations. Historians diplomatically came up with "The General von Steuben" for the VIP hotel and "The Amelia Earhart" for the DAF civilian hotel.

The Air Force historian is often asked to serve as consultant to movie moguls or to edit or review radio and TV scripts, such as the twenty-six films for the Columbia Broadcasting System series, "Air Power." He is also bombarded with queries from students, writers, and amateur historians.

But above all, the Air Force historian is particularly aware of his responsibility to his commander and USAF as a whole. He knows that accuracy and completeness of the record are essential to America's decision-makers in shaping national security.

Gen. Thomas D. White, USAF's Chief of Staff, summed up the historical program's contribution recently in a letter to all major commands:

"For utility value today, for our research purposes in the near future, and for posterity's study in more distant times, the history of the Air Force is vitally important.

"Every aspect, fact, and thought behind our current decisions and our position on national defense organization, weapon system development, and other controversial matters must be completely and accurately recorded now, while our files and faculties are full and functioning."—END

Navy's CORVUS Air-to-Surface Missile Designed and Produced by TEMCO

TI TELEMETRY
in Missile Systems

APPARATUS DIVISION

TEXAS INSTRUMENTS
INCORPORATED
6000 LEMMON AVENUE • DALLAS 9, TEXAS

The author, Mary Finch Tanham, is a free-lance writer and researcher in the nation's capital. She has contributed in the recent past to the Washington Star, *the* Baltimore Sun, Army *Magazine, and the* VFW (*Veterans of Foreign Wars*) *Magazine. A native Californian, Mrs. Tanham also contributes to the women's pages of a number of West Coast papers and covers film activities in Washington for* Business Screen *Magazine.*

This Is AFA

The Air Force Association is an independent, nonprofit airpower organization with no personal, political, or commercial axes to grind; established January 26, 1946; incorporated February 4, 1946.

Objectives

• To assist in obtaining and maintaining adequate airpower for national security and world peace. • To keep the AFA members and the public abreast of developments in the field of aviation. • To preserve and foster the spirit of fellowship among former and present personnel of the United States Air Force.

Membership

Active Members: Individuals honorably discharged or retired from military service who have been members of, or either assigned or attached to, the USAF or its predecessor services, or who are currently enrolled in the Air Force Reserve or the Air National Guard. $6.00 per year.
Service Members (nonvoting, nonofficeholding): Military personnel now assigned or attached to the USAF. $6.00 per year.
Cadet Members (nonvoting, nonofficeholding): Individuals enrolled as Air Force ROTC Cadets, Civil Air Patrol Cadets, or Cadets of the US Air Force Academy. $3.00 per year.
Associate Members (nonvoting, nonofficeholding): Individuals not otherwise eligible for membership who have demonstrated their interest in furthering the aims and purposes of the Air Force Association. $6.00 per year.
Industrial Associates: Companies affiliating with the Air Force Association on a nonmembership status that receive subscriptions to AIR FORCE Magazine and SPACE DIGEST, special magazine supplements, and Industrial Service Reports.

Officers and Directors

HOWARD T. MARKEY, President, Chicago, Ill.; **George D. HARDY**, Secretary, College Park, Md.; **JACK B. GROSS**, Treasurer, Harrisburg, Pa.; **JULIAN B. ROSENTHAL**, Chairman of the Board, New York.

REGIONAL VICE PRESIDENTS: Philipe F. Coury, Mattapan, Mass. **(New England)**; Harry Crutcher, Jr., Dallas Tex. **(Southwest)**; Willard L. Dougherty, Cleveland, Ohio **(Great Lakes)**; Dale R. Erickson, Ogden, Utah **(Rocky Mountain)**; Joseph L. Hooges, Danville, Va. **(Central East)**; Roy J. Leffingwell, Honolulu **(Pacific Ocean)**; Robert H. Mitchell. Portland, Ore. **(Northwest)**; Alex G. Morphonios, Maimi, Fla. **(Southeast)**; Chess Pizac, St. Louis, Mo. **(Midwest)**; Edwin W. Rawlings, Minneapolis, Minn. **(North Central)**; Chester A. Richardson, Pittsburgh, Pa. **(Northeast)**; Will O. Ross, Mobile, Ala. **(South Central)**; James C. Snapp, Jr., San Diego, Calif. **(Far West)**.

DIRECTORS: John R. Alison, Hawthorne, Calif.; **Lucas V. Beau**, Washington, D. C.; **Walter T. Bonney**, Silver Spring, Md.; **Roger J. Browne**, New York, N. Y.; **Lee Cordell**, Forest Park, Ill.; **Edward P. Curtis**, Rochester, N. Y.; **James R. Dempsey**. San Diego, Calif.; **James H. Doolittle**, Los Angeles, Calif.; **A. Paul Fonda**, Washington, D. C.; **Joseph J. Foss**, Sioux Falls, S. D.; **J. Wayne Fredericks**, Bronxville, N. Y.; **John P. Henebry**, Kenilworth, Ill.; **Robert S. Johnson**, Woodbury, N. Y.; **Arthur F. Kelly**, Los Angeles, Calif.; **George C. Kenney**, New York, N. Y.; **Thomas G. Lanphier, Jr.**, La Jolla, Calif.; **W. Barton Leach**, Cambridge, Mass.; **Harvey J. McKay**, Glendale, Calif.; **John B. Montgomery**, Cincinnati, Ohio.; **Charles O. Morgan, Jr.**, San Francisco, Calif.; **Msgr. William F. Mullally**, St. Louis, Mo.; **Peter J. Schenk**, Waltham, Mass.; **C. R. Smith**, New York, N. Y.; **Carl A. Spaatz**, Chevy Chase, Md.; **William W. Spruance**, Wilmington, Del.; **Arthur C. Storz**, Omaha, Neb.; **Harold C. Stuart**, Tulsa, Okla.; **James M. Trail**, Boise, Idaho; **Alden A. West**, DeWitt, N. Y.; **Gill Robb Wilson**, LaVerne, Calif.; **Leonard A. Work**, State College, Pa.; **Paul S. Zuckerman**, New York, N. Y.; **Thomas E. Cindric**, National Commander, Arnold Air Society, Pittsburgh, Pa.; (ex officio); **Rev. William Laird**, National Chaplin, Haddon Heights, N. J. (ex officio).

Community Leaders

ALABAMA: Brig. Gen. George R. Doster, Jr., Sumter-Smith ANG Base, **Birmingham**; John Starke, 3110 Valeria St., **Mobile**; Jack Parsons, 144 Arlington Rd., **Montgomery**.

ALASKA: Dan Plotnick, P. O. Box 2072, **Anchorage**.

ARIZONA: True W. Childs, 3237 E. Mitchell Dr., **Phoenix**.

CALIFORNIA: Tom Mason, P. O. Box 330, **Chico**; E. R. Grantham, 728 Nevada St., **Fairfield**; W. A. O'Brien, P. O. Box 3290, **Fresno**; Clarence Hanson, 646 6th St., **Hermosa Beach**; Glenn Miller, 3827 San Anselino, **Long Beach**; Stanley J. Hryn, P. O. Box 1253, **Monterey**; R. L. Painchaud, P. O. Box 474M, **Pasadena**; Sydney Lewis, 26904 Fond du Lac Rd., **Rolling Hills**; John Silliman, 3437 Chenu, **Sacramento**; Edward A. Feille, Jr., P. O. Box 4006, **San Bernardino**; George Mays, 3038 Poinsetta Dr., **San Diego**; William N. Cothran, 929 Mission St., **San Francisco**; Ronald B. McDonald, 659 19th St., **San Pedro**; George Floyd, 529 W. Santa Clara, **Santa Ana**; Joseph Myers, P. O. Box 1111, **Santa Monica**; Bob Hamilton, P. O. Box 2067, **Van Nuys**; Lyle Whitlock, 903 S. Shasta, **W. Covina**.

COLORADO: Kenneth Costello, 6373 Teller St., **Arvada**; William B. Offutt, Box 1051, **Colorado Springs**; Phillip J. Carosell, Majestic Bldg., **Denver**; Arthur H. Kroell, Box 212, **Lamar**; Thomas C. Hausman, P. O. Box 1143, **Pueblo**.

CONNECTICUT: Laurence Cerretani, 139 Silvermine Rd., **New Canaan**.

DISTRICT OF COLUMBIA: Lucas V. Beau, 2610 Upton St., N. W.

FLORIDA: Edward L. Hurlburt, 1152 Cleveland St., **Clearwater**; Edward Aronson, 204 S. 28th St., **Hollywood**; Cliff Mayfield, 5416 Oliver St., N., **Jacksonville**; Ted Koschler, 10803 N. E. 9th Ave., **Miami**.

GEORGIA: John T. Allan, 650 Hurt Bldg., **Atlanta**; Joseph A. Sellars, 401 S. Woodland Dr., **Marietta**; Phillips D. Hamilton, 136 E. 50th St., **Savannah**.

HAWAII: Roy J. Leffingwell, 116 S. King St., **Honolulu**.

IDAHO: William Bozman, Box 1098, **Boise**, Ralph E. Funke, 508 2d St., **Coeur d'Alene**; Robert E. Scott, 813 Maplewood Dr., **Idaho Falls**.

ILLINOIS: Donald Clute, 421 Cooper Ave., **Elgin**; Harold Carson, 9541 Lawton Ave., **Oak Lawn (Chicago Area)**; Ross Merritt, 2105 Washington St., **Waukegan**.

INDIANA: Ben J. Barrett, 433 Trevor St., **Brownsburg**.

IOWA: Dwaine Lighter, Box 384, **Algona**; Dr. C. H. Johnston, 4820 Grand Ave., **Des Moines**; Ken Kalahar, P. O. Box 884, **Mason City**.

KANSAS: Henry Farha, Jr., 220 N. Green, **Wichita**.

LOUISIANA: Vane T. Wilson, Box 7515, LSU, **Baton Rouge**; Neill M. Kivett, 613 Ave. I, **Bogalousa**; John K. Moore, 1818 4th St., **Harvey**; Walter Kay, Jr., 1707 Broadmoor Dr., **Lake Charles**; Myron Lowell, 739 Homestead Ave., **Metairie**; W. E. Giffhorn, 117 Leo Ave., **Shreveport**.

MARYLAND: John J. Pondfield, Box 3725, **Baltimore**; George A. Hatcher, Box 333, **Hagerstown**.

MASSACHUSETTS: Joseph E. Assaf, 130 Turtle Pond Pkwy, **Hyde Park**; Henry J. Hurley, 15 Fairbanks Rd., **Lexington**; Samuel D. Wade, P. O. Box 195, **Lexington**; Edward Tufts, 25 Oak St., **Marblehead**; Nicholas P. Morrissey, Jr., 28 Winbrough St., **Mattapan**; Herbert E. Maguire, 92 Fern Rd., **Medford**; Alfred H. Cola, 1562 Main St., **Springfield**; Ronald Groleau, 48 Santa Barbara St., **Springfield**; R. Gerald LaChance, 5 Monica St., **Taunton**; Joseph A. Ruseckas, 19 Housatonic St., **Worcester**.

MICHIGAN: Deland H. Davis, 221 Summer, **Battle Creek**; Fred Bonjour, 1478 Larkmoor Blvd., **Berkley**; R. G. Saltsman, 208 Larchlea, **Birmingham**; Jerome Green, 23090 Parklawn, **Oak Park (Detroit Area)**; Harold Schaffer, 2208 Barstow, **Lansing**; Paul Schmelzer, 22500 O'Connor, **St. Clair Shores**.

MINNESOTA: W. K. Wennberg, 4 Carlson, **Duluth**; Edwin Kube, 5353 29th Ave. S. **Minneapolis**; Russell Thompson, 2834 N. Griggs St., **St. Paul**.

MISSOURI: A. L. Hillix, 450 W. 51st St., **Kansas City**; Sterling Thompson, 8235 Paramount, **St. Louis**.

NEBRASKA: Walter I. Black, 3615 S. 37th St., **Lincoln**; Lloyd Grimm, 5103 Hamilton St., **Omaha**.

NEVADA: Barney Rawlings, Convention Center, **Las Vegas**.

NEW JERSEY: Tom Gagen, 512 Garfield Ave., **Avon**; Morris H. Blum, 452 Central Ave., **E. Orange**; William Bromirski, 221 Warren St., **Jersey City**; John F. Russo, 471 3d St., **Palisades Park**; Nathan Lane, 135 E. 32d St., **Paterson**; Italo Quinto, Box 309, **Stirling**.

NEW YORK: Leroy Middleworth, 387 Myrtle Ave., **Albany**; Don Pellow, 118 Rees St., **Buffalo**; Fred Monsees, 62 Oakland Ave., **Lynbrook (Metropolitan Area)**; John Grant, 407 Elm St., **Rome**; Marc Terziev, 109 Cherry St., **Syracuse**.

NORTH CAROLINA: R. P. Woodson, III, 2513 Anderson Dr., **Raleigh**.

OHIO: Clyde Haught, 2274 11th St., **Akron**; Herbert L. Bryant, 912 7th St., **Canton**; John A. Repasy, 3629 Lansdowne Ave., **Cincinnati**; Ray Saks, 2823 Sulgrave Rd., **Cleveland**; Morris Ribbler, 1912 Hazel Ave., **Dayton**; Herb Your, 2633 104th St., **Toledo**.

OKLAHOMA: W. G. Fenity, 430 S. Van Buren, **Enid**; Robert Durkee, 224 W. Eubands, **Oklahoma City**.

OREGON: Clyde Hilley, 2141 N. E. 23d Ave., **Portland**.

PENNSYLVANIA: John Malay, 462 Maplewood Ave., **Ambridge**; Roger Ellis, P. O. Box 1001, **Erie**; David Lenker, 7700 Sunset Dr., **Harrisburg**; Phillip Halfpenny, P. O. Box 103, **Lewistown**; Sally F. Downing, 417 S. 44th St., **Philadelphia**; John H. Kruper, Box 1904A, **Pittsburgh**; George M. Keiser, 21 So. 21st St., **Pottsville**; J. J. Kapitanoff, 1000 N. Atherton St., **State College**; Joseph Chancler, Willow Grove NAB, **Willow Grove**.

RHODE ISLAND: M. A. Tropea, Industrial Bank Bldg., **Providence**.

SOUTH DAKOTA: Rex Waltz, 804 7th St., **Brookings**; Duane L. Corning, Joe Foss Field, **Sioux Falls**.

TENNESSEE: L. W. Frierson, III, Hamilton National Bank Bldg., **Knoxville**; Jerred Blanchard, 1230 Commerce Title Bldg., **Memphis**; James W. Rich, 3022 23d Ave., S., **Nashville**.

TEXAS: Frank J. Storm, Jr., Box 1983, **Amarillo**; James M. Rose, Box 35404, Airlawn Sta., **Dallas**; Bob A. Roberts, 2903 N. Zarzamora St., **San Antonio**.

UTAH: Rex T. Carlisle, 3 E. 1400th S., **Bountiful**; Leroy Crossley, 4050 Porter Ave., **Ogden**.

VIRGINIA: William McCall, Jr., 6007 27th Rd., So., **Arlington**; Roy H. Hodge, Jr., 157 Marshall St., **Danville**; Arthur E. Stump, Jr., Box 841, **Lynchburg**; Robert W. Love, P. O. Box 2021, **Norfolk**; John Ogden, Jr., 3425 Ellwood Ave., **Richmond**.

WASHINGTON: Roy F. Hanney, Cooper-George Bldg., **Spokane**.

WISCONSIN: Merrill H. Guerin, 504 Franklin, **DePere**; Gary Ortmann, 2910 S. Logan Ave., **Milwaukee**.

National Headquarters Staff

Executive Director: James H. Straubel; **Administrative Director:** John O. Gray; **Program Director, and Convention and Exhibit Director:** Ralph V. Whitener; **Convention Manager:** William A. Belanger; **Production Manager:** Herbert B. Kalish; **Organization Director:** Gus Duda; **Exhibit Manager:** Robert C. Strobell; **Director of Industrial Relations:** Stephen A. Rynas; **Director of Insurance Programs:** Richmond M. Keeney; **Director of Accounting:** Muriel Norris.

TACTICAL COMMUNICATIONS:

* CRIMEA 1854 *

'. . .'Forward the Light Brigade!
Charge for the guns!' he said.
Into the valley of Death
Rode the six hundred.

. . . Was there a man dismay'd?
Not tho' the soldier knew
Someone had blunder'd.
Theirs not to make reply,
Theirs not to reason why,
Theirs but to do or die.
Into the valley of Death
Rode the six hundred.

. . . Cannon to right of them,
Cannon to left of them,
Cannon behind them
Volley'd and thunder'd;
Storm'd at with shot and shell,
While horse and hero fell,
They that had fought so well
Came thro' the jaws of Death . . .
. . . All that was left of them,
Left of six hundred.

ALFRED LORD TENNYSON

RICHARD CATON WOODVILLE, JR. "Charge of the Light Brigade." Parker Gallery, London

Blundering tactical command in this age of quick-reaction military operations may not be similarly immortalized. Today, instantaneous and completely reliable Electronic Communications, both voice and tactical data link, provide the continuous two-way intelligence that precludes the blunders which sealed the fate of the Light Brigade.

ECI is proud to play an important part in insuring that such Electronic Communications exist for our defense in space, airborne and surface roles, with the creation of systems such as its fully integrated Model 28, 1 KW UHF Communication equipment, capable of inclusion in advanced Tactical Data Systems, as well as in airborne applications and in the nation's continually expanding systems of Early Warning.

One of a series of advertisements depicting historic incidents in military communications through the ages

ELECTRONIC COMMUNICATIONS INC. St. Petersburg, Florida

Specialists in Systems Development, Advanced Voice and Data Link Communications, Countermeasures, Secure Communications and Related Equipment

Regional Offices: Washington, D.C., Dayton, Ohio, Teterboro, N. J., Dallas, Texas, No. Hollywood, California

Convair's B-58 the free world's fastest bomber, flies at more than twice the speed of sound twice as fast as any other U.S. bomber now operational. It is now entering service with the U.S. Air Force.

A DIVISION OF GENERAL DYNAMICS CORPORATION